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AUSTROBAILEYA

A Journal of Plant Systematics

Queensland Herbarium

Queensland Government
Environmental Protection Agency

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Volume 7 Number 4 2008

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A taxonomic revision of *Beyeria* Miq. (Euphorbiaceae: *Ricinocarpeae*, *Ricinocarpinae*)

David A. Halford and Rodney J.F. Henderson

Summary

Halford, D.A. & Henderson, R.J.F. (2008). A taxonomic revision of *Beyeria* Miq. (Euphorbiaceae: *Ricinocarpeae*, *Ricinocarpinae*). *Austrobaileya* 7(4): 577–639. The genus *Beyeria* Miq. is endemic to Australia. Twenty-four species are recognised and a key provided for their identification. The following species are described here as new: *Beyeria apiculata* Halford & R.J.F.Hend., *B. cockertonii* Halford & R.J.F.Hend., *B. constellata* Halford & R.J.F.Hend., *B. disciformis* Halford & R.J.F.Hend., *B. lanceolata* Halford & R.J.F.Hend., *B. lapidicola* Halford & R.J.F.Hend., *B. physaphylla* Halford & R.J.F.Hend., *B. rostellata* Halford & R.J.F.Hend., *B. simplex* Halford & R.J.F.Hend., *B. sulcata* Halford & R.J.F.Hend. and *B. villosa* Halford & R.J.F.Hend. A new subspecies and new variety are described, namely *Beyeria cinerea* subsp. *borealis* Halford & R.J.F.Hend. and *B. sulcata* var. *gracilis* Halford & R.J.F.Hend. The new combinations *Beyeria sulcata* var. *brevipes* (Airy Shaw) Halford & R.J.F.Hend., based on *B. brevifolia* var. *brevipes* Airy Shaw and *B. sulcata* var. *truncata* (Airy Shaw) Halford & R.J.F.Hend., based on *B. brevifolia* var. *truncata* Airy Shaw, are made. *Beyeria calycina* var. *minor* Airy Shaw is raised to specific rank as *B. minor* (Airy Shaw) Halford & R.J.F.Hend. The new taxa are illustrated and distinguished from related taxa while all taxa are described and mapped with notes provided on their habitat, distribution and phenology. Lectotypes are chosen for *Beyeria drummondii* Müll.Arg., *Beyeria latifolia* Baill., *Beyeria lechenaultii* forma *elaeagnoides* Baill., *Beyeria lechenaultii* forma *pernettioides* Baill., *Beyeria lechenaultii* forma *rosmarinoides* Baill., *Beyeria lechenaultii* var. *latifolia* Grüning, *Beyeria lepidopetala* F.Muell., *Beyeria opaca* F.Muell., *Beyeria opaca* var. *linearis* Benth., *Beyeria viscosa* var. *amoena* Müll.Arg., *Beyeria viscosa* var. *angustifolia* F.Muell. & Tate, *Beyeriopsis latifolia* Müll.Arg. and *Croton viscosus* Labill. All known synonyms are listed here.

Key Words: Euphorbiaceae, *Beyeria*, *Beyeria apiculata*, *Beyeria cinerea* subsp. *borealis*, *Beyeria cockertonii*, *Beyeria constellata*, *Beyeria disciformis*, *Beyeria lanceolata*, *Beyeria lapidicola*, *Beyeria minor*, *Beyeria physaphylla*, *Beyeria rostellata*, *Beyeria simplex*, *Beyeria sulcata*, *Beyeria sulcata* var. *brevipes*, *Beyeria sulcata* var. *gracilis*, *Beyeria sulcata* var. *truncata*, *Beyeria villosa*, Australia, Australian flora, taxonomy, nomenclature, identification keys

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Introduction

Beyeria Miq. is endemic to Australia with 24 species recognised in the present revision. Species of *Beyeria* are woody, perennial shrubs or small trees and the majority grow in shrubland, heathland or dry sclerophyll open forest or woodland communities, in a variety of soils derived from diverse geologies. The species are largely temperate in their distribution (**Map 1**) with the majority endemic to south-western Australia.

The genus was established in 1844 by Friedrich Miquel who named a single species, *Beyeria viscosa* Miq., based on material collected by Ludwig Preiss in 1839 at Rottnest Island, Western Australia (Miquel 1844). The name commemorates Adriaan de Beyer [de Beijer] (1773–1843) who Miquel described as a dedicated worker for his studies of cryptogramic plants in Batavia (Netherlands). For more detailed biographical information of A. de Beyer refer to Bouwer (2006). Miquel listed the following characters for his new genus: flowers dioecious and without petals, calyx 5-partite, anthers extrorse, ovary with uniovulate locules and stigma pileiform, entire and sessile. At the time, Miquel considered *Beyeria* showed affinities with the "tribe of Crotons". However, he noted the stigma structure distinguished *Beyeria* from the genera of the tribe.

In 1845, Johann Klotzsch in Lehmann's *Plantae Preissianae*, published the genus

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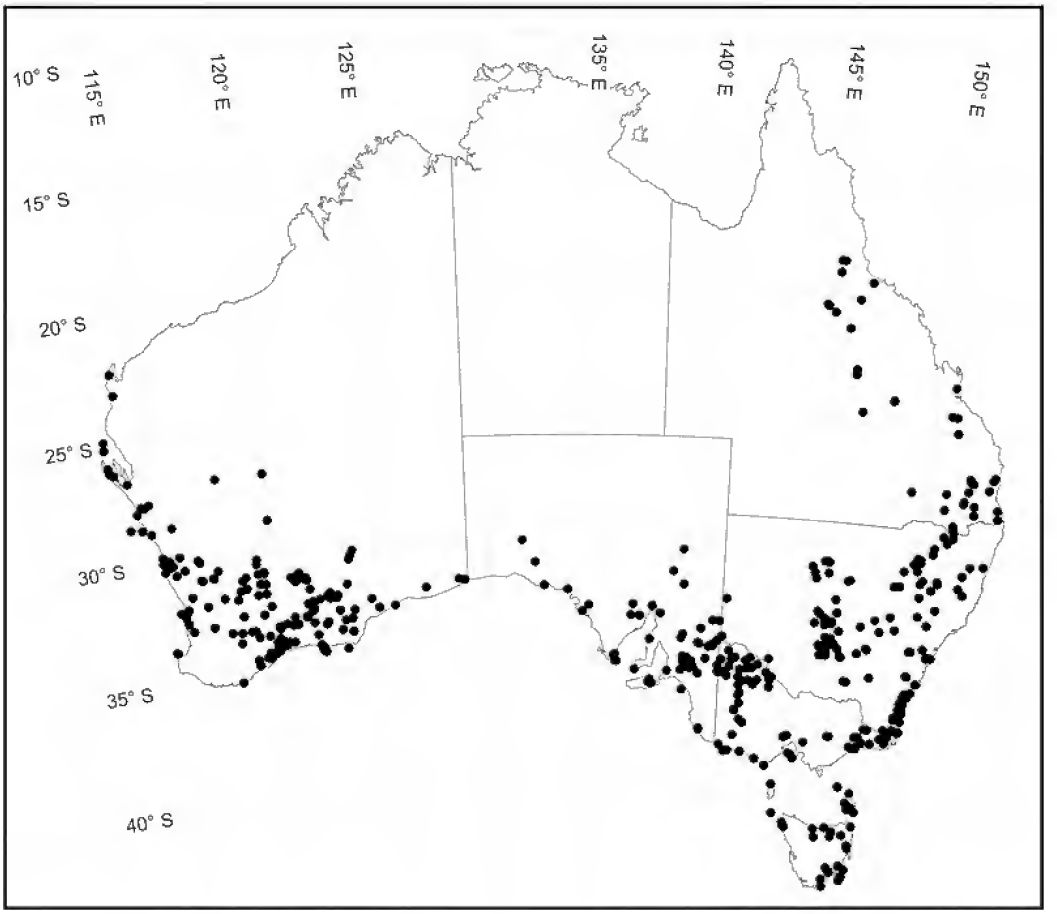

Map 1. Distribution of the genus *Beyeria* in Australia.

Calyptrostigma Klotzsch to accommodate *Croton viscosus* Labill. and in a footnote described two new species (*Calyptrostigma ledifolium* Klotzsch and *C. oblongifolium* Klotzsch) based on collections in the Lindley Herbarium (now at CGE) and Willdenow Herbarium (now at B-Willd.), respectively (Klotzsch 1845). Labillardière based his *Croton viscosus* on material he collected from southern Australia in 1792 while a member of D'Entrecasteaux's expedition (Labillardière 1806). Klotzsch placed *Calyptrostigma* within the tribe *Crotoneae* Blume, but did not indicate the affinities of his new genus.

In the previous year Miquel (1844) had stated in the protologue of *Beyeria* that it had not been possible to confirm whether Labillardière's *Croton viscosus* was the same as his *Beyeria viscosa* as no specimen of *Croton viscosus* was available to him at the time. However, he considered that Labillardière's species (*Croton viscosus*) seemed most likely to belong to his new genus *Beyeria.*

Eleven years later, Sonder (1857) transferred *Calyptrostigma ledifolium* and *C. oblongifolium* to *Beyeria* and created a new name, *Beyeria preissii* Sond., for the plants Klotzsch described under the name "*C. viscosum* Klotzsch" at the same time specifically excluding *Croton viscosus* of Labillardière. Sonder listed *Croton viscosum* Labill. as a synonym of *Beyeria viscosa.* The name *Beyeria preissii* was nomenclaturally superfluous when published by Sonder, since he included within this species a duplicate of the type of *B. viscosa* Miq.

In a precursory paper to the publication of De Candolle's *Prodromus*, Jean Müller (Müller Argovensis) (1865) established the genus *Beyeriopsis* and described five species (*B. cygnorum* Müll.Arg., *B. cinerea* Müll.Arg., *B. latifolia* Müll.Arg., *B. similis* Müll.Arg. and *B. brevifolia* Müll.Arg.) based on collections from south-western Western Australia made by James Drummond and Augustus Oldfield. He also transferred *Beyeria lepidopetala* F.Muell. to *Beyeriopsis*. He considered *Beyeriopsis* to be closely related to *Beyeria* from which it was distinguished on the basis of its staminal structure. *Beyeriopsis* was described as having staminal filaments bifid at the apex and anthers with 2 discrete separate locules compared with *Beyeria* which had staminal filaments entire and anthers with 2 separate but contiguous locules. Müller also divided *Beyeria* into two sections (*B.* sect. *Discobeyeria*, and *B.* sect. *Eubeyeria* (*nom. inval.* = *B.* sect. *Beyeria*)) based principally on the presence or absence of a disc and petals in the flowers. However, at the time, he did not arrange the then known species into the sections, but named two new species (*Beyeria drummondii* Müll.Arg. and *B. lasiocarpa* Müll.Arg.) which he indicated belonged to *B.* sect. *Discobeyeria* and *B.* sect. *Beyeria* respectively.

The following year in De Candolle's *Prodromus*, Müller (1866) maintained the two genera, enumerating seven species in *Beyeriopsis*, which included the new species *B. cyanescens* Müll.Arg. He divided the genus into two unnamed 'sections', one 'Flores dioici' contained *B. cygnorum*, *B. lepidopetala*, *B. cinerea* and *B. cyanescens* the other 'Flores monoici' contained *B. latifolia*, *B. similis* and *B. brevifolia*. Müller accepted five species as belonging to *Beyeria*, placing *B. backhousei* Hook.f. and *B. oblongifolia* (Klotzsch) Sond. in synonymy of *B. ledifolium* (Klotzsch) Sond. and *B. viscosa* respectively and recognising seven varieties; *B. viscosa* var. *genuina* (=*B. viscosa* var. *viscosa*), *B. viscosa* var. *oblongifolia*, *B. viscosa* var. *minor*, *B. viscosa* var. *amoena*, *B. ledifolia* var. *genuina* (= *B. ledifolia* var. *ledifolia*), *B. ledifolia* var. *backhousei* ('*backhousii*') and *B. ledifolia* var. *angustifolia*. He maintained the sectional division in *Beyeria* with *B.* sect. *Discobeyeria* containing a single species *B. drummondii*, while *B.* sect. *Beyeria* contained *B. lasiocarpa*, *B. viscosa*, *B. ledifolia* and *B. opaca* F.Muell.

Baillon (1866) considered the differences in the androecium between *Beyeria* and *Beyeriopsis* were insufficient to warrant recognition of two genera. However, he didn't transfer the *Beyeriopsis* species of Müller's to *Beyeria*. Baillon transferred the name *Hemistema* ('*Hemistemma*') *lechenaultii* DC. to *Beyeria*, described *B. uncinata* Baill. (now in synonymy of *Eremophila sturtii* R.Br.), *B. lasiocarpa* forma *denudata* Baill, *B. lechenaultii* forma *genuina* (= *B. lechenaultii* forma *lechenaultii*), *B. lechenaultii* forma *pernettioides* Baill., *B. lechenaultii* forma *myrtoides* Baill., *B. lechenaultii* forma *rosmarinoides* Baill., *B. lechenaultii* forma *salsoloides* Baill., *B. lechenaultii* forma *vaccinioides* Baill. and placed *Calyptrostigma ledifolium*, *C. oblongifolium* and *B. drummondii* in synonymy of *B. lechenaultii* (DC.) Baill., *B. viscosa* and *B. opaca* respectively.

In his account of *Beyeria* in *Flora Australiensis*, Bentham (1873) followed Baillon in treating *Beyeriopsis* as congeneric with *Beyeria* and transferred Müller's *Beyeriopsis* species to *Beyeria*. He recognised 13 species, and described *B. viscosa* var. *linearis* Benth. and *B. opaca* var. *linearis* Benth., but did not comment on the infraspecific taxa previously published by Müller and Baillon. Bentham arranged the species into three sections based primarily on stamen and stigma features. The first section *Beyeria* sect. *Eubeyeria* (*nom. inval.* = *B.* sect. *Beyeria*) was characterised by "anthers twice as long as broad, adnate to an entire or scarcely lobed connective, stigma entire or scarcely lobed" and included four species namely *B. viscosa*, *B. opaca* (for which *B. lechenaultii*, *B. ledifolia* Sond. *non* Klotzsch and *B. backhousei* were listed as synonyms), *B. lasiocarpa* and *B. uncinata* (=*Eremophila sturtii*). The second section *Beyeria* sect. *Beyeriopsis* (*nom. superfl.)* was characterised by "anthers short, the locules quite distinct, either adnate to a deeply 2-lobed connective or partially free with the connective more entire and stigmas entire or scarcely lobed" and

contained eight species namely *B. latifolia*, *B. cygnorum* (Müll.Arg.) Benth., *B. cinerea* (Müll.Arg.) Benth., *B. cyanescens* (Müll.Arg.) Benth., *B. lepidopetala*, *B. similis* (Müll.Arg.) Benth., *B. brevifolia* (Müll.Arg.) Benth. and *B. drummondii* (for which *Calyptrostigma ledifolium* was listed as a synonym). The name *Beyeria* sect. *Beyeriopsis* was nomenclaturally superfluous when published by Bentham, since he included within this section *B. drummondii* which was the sole species Müller had included in the section he earlier had named *Beyeria* sect. *Discobeyeria*. The third section Bentham recognised was *Beyeria* sect. *Oxygyne* F.Muell. characterised by "anthers of *Beyeriopsis*, stigma deeply lobed male flowers in a loose raceme" and contained a single species namely *B. tristigma* F.Muell.

In the most recent and complete taxonomic treatment of *Beyeria*, Grüning (1913) recognised 12 species and, following Bentham, grouped them into three sections.

Grüning's treatment of the genus differed from Bentham's in excluding *Beyeria uncinata* (= *Eremophila sturtii* R.Br.), maintaining *B. lechenaultii* and *B. opaca* as separate species and placing *B. drummondii* and *B. backhousei* in synonymy of *B. lechenaultii*. Grüning maintained the four varieties of *Beyeria viscosa* described by Müller (1866), described *B. opaca* var. *longifolia* Grüning, *B. lechenaultii* var. *latifolia* Grüning and made new combinations from *B. backhousei*, *Calyptrostigma ledifolium*, *B. lechenaultii* forma *rosmarinoides* and *B. drummondii* as the varieties *B. lechenaultii* var. *backhousei* (Hook.) Grüning, *B. lechenaultii* var. *ledifolium* (Klotzsch) Grüning, *Beyeria lechenaultii* var. *rosmarinoides* (Baill.) Grüning and *B. lechenaultii* var. *drummondii* (Müll. Arg.) Grüning.

In the present study the authors have maintained the sectional division of *Beyeria* as presented by Grüning (1913) excluding *B.* sect. *Oxygyne*. Halford & Henderson (2005) established the genus *Shonia* R.J.F.Hend. & Halford to accommodate *Beyeria tristigma*, the sole species included in *B.* sect. *Oxygyne*. As stated previously (Halford & Henderson 2005, 2007; Webster 1994; Wurdack *et al.* 2005) *Beyeria* is closely related to *Ricinocarpos* Desf., *Shonia* R.J.F.Hend. & Halford and *Bertya* Planch. within the Euphorbiaceae. *Beyeria* is distinguished from *Ricinocarpos*, *Shonia* and *Bertya* by the following combination of features: flowers in fascicles or cymose clusters or solitary, male flowers with staminal filaments free, erect to spreading on a flat or slightly convex to hemispherical receptacle and stigmas entire, dilated and forming a cap over the top of the ovary, discoid or rarely with 2 appressed limbs or shallowly 3-lobulate. For a key to the Australian genera of Euphorbiaceae tribe *Ricinocarpeae* refer to Halford and Henderson (2005).

Materials and methods

This revision is based on an assessment of morphological characters of about 1350 dried herbarium specimens and field studies undertaken by the second author from 1988 to 1992 and by the first author in 2006. Selected herbarium collections from herbaria AD, B, BRI, CANB, HO, K, LD, MEL, NE, NSW, P and PERTH were studied and annotated. Acronyms used here and elsewhere to indicate herbaria holding particular specimens are those listed by Holmgren *et al.* (1990). All specimens cited have been examined by one or both of the authors, unless indicated otherwise by '*n.v.*'.

Colour descriptions of vegetative and floral parts are either from the information on herbarium labels or from photographs taken by the second author during field studies. Measurements listed are based upon the total variation observed in the herbarium specimens examined. Information on plant size, flowering and fruiting times, and habitat of occurrence were obtained from herbarium labels. All measurements were made either on fresh material, dried material, material preserved in 70% ethanol or dried material reconstituted by placing in boiling water for a few minutes. The distribution maps were produced with MapInfo Version 3 and are based on herbarium specimen locality data.

Common abbreviations used in the text are N.P. (National Park), N.R. (Nature Reserve), N.S.W. (New South Wales), Qld (Queensland),

S.A. (South Australia), S.F./S.F.R. (State Forest/ State Forest Reserve), Tas. (Tasmania), Vic. (Victoria), W.A. (Western Australia).

Taxonomy

Beyeria Miq., *Ann. Sci. Nat. Bot.* ser. 3, 1: 350–352, t. 15 (1844). **Type:** *B. viscosa* Miq.

Beyeriopsis Müll.Arg., *Linnaea* 34: 56 (1865). **Type:** *Beyeriopsis brevifolia* Müll.Arg., [= *Beyeria brevifolia* (Müll.Arg.) Benth.] (lecto: *fide* Wheeler 1975: 535).

Calyptrostigma Klotzsch in J.G.C.Lehmann, *Pl. Preiss.* 1(2): 175 (1845). **Type:** *C. viscosum* (Labill.) Klotzsch

Monoecious or rarely dioecious **shrubs or small trees**, often resinous on most parts; branches glabrous or with an indumentum of stellate or rarely simple hairs. **Leaves** spirally alternate, exstipulate, petiolate or rarely sessile, simple, entire, margins flat, recurved or revolute, marginal glands absent or present mostly on blade proximally. **Flowers** axillary or terminal on short axillary branchlets, pedicellate rarely ± sessile, in few-flowered fascicles or cymose clusters or solitary, bracteate, gamosepalous; calyx deeply 5(rarely 4 or 6)–lobed, subequal, imbricate (quincuncial); petals present, 5(rarely 4) or absent, slightly shorter than or equal in length to calyx lobes; disc present or absent, of discrete alternipetalous glands or forming a continuous glandular ring. **Male flowers** with receptacle flat to hemispherical; stamens numerous (> 9); filaments free, ± erect or spreading, mostly bifid distally; anthers dorsifixed, extrorse, of two separate, parallel but contiguous cells, each transverse or lateral on the apex of the filament, dehiscing by longitudinal slits; pistillode absent. **Female flowers** with calyx lobes persistent, rarely accrescent; petals sometimes marcescent; ovary 2- or 3(rarely 1)-locular with one pendant ovule in each locule; style short or ± obsolete; stigma elobate or shallowly 3-lobulate, calyptriform, discoid, or rarely bipartite, persistent. **Fruits** capsular, ellipsoid, ovoid or subglobose, mostly trilobate, glabrous or densely hairy, smooth or papillose, mostly 2- or 3(rarely 1)-seeded, separating septicidally often into three 2-valved cocci leaving a persistent columella. **Seeds** ellipsoid and dorsi-ventrally compressed, globose or obloid, carunculate; testa smooth, shiny, often blotched; caruncle creamy-white, yellowish-white, or light brown, waxy-fleshy; endosperm copious; embryo linear, in the middle of the endosperm, cotyledons longer than the radicle.

Key to sections of *Beyeria*

Flowers apetalous or if rudimentary petals present then < half the length of calyx lobes; calyx lobes of male flowers spreading at anthesis . . . . . **B.** sect. **Beyeria**

Flowers with petals, slightly shorter than or equal to calyx lobes; calyx lobes of male flowers ± erect, enclosing or appressed to androecium at anthesis . . . . . **B.** sect. **Beyeriopsis**

Beyeria Miq. sect. **Beyeria**, Müll.Arg., *Linnaea* 34: 58 (1865). **Type:** *B. viscosa* Miq.

Beyeria sect. *Discobeyeria* Müll.Arg., *Linnaea* 34: 58 (1865). **Type:** *B. drummondii* Müll.Arg.

Beyeria sect. *Eubeyeria* Müll.Arg., *Linnaea* 34: 58 (1865), *nom. inval.*

Shrubs or small trees. **Flowers** apetalous or petals rarely present as rudimentary lobes. **Male flowers** with calyx lobes spreading at anthesis; receptacle convex to hemispherical; filaments entire; anthers of two separate, obloid or linear, parallel but contiguous cells, each lateral on the apex of the filament. **Female flowers** with stigmas calyptriform or rarely bipartite.

***Distribution*:** The species of *Beyeria* sect. *Beyeria* occur in Western Australia, South Australia, Queensland, New South Wales, Victoria and Tasmania.

Key to species of *Beyeria* sect. *Beyeria*

1 Ovaries and fruits densely hairy, non-resinous (N.S.W., Qld, Vic.) . . . . . **2. B. lasiocarpa**
1. Ovaries and fruits glabrous or with a few scattered hairs, usually resinous 2

2 Stigmas bipartite; lobes ± oblong, *c.* 1 mm long, appressed to ovary (S.A.) . . . . . **5. B. subtecta**
2. Stigmas entire, calyptriform 3

3 Abaxial surface of leaf blades densely tomentellous with crispate hairs > 0.1 mm long, never resinous (N.S.W., S.A., Tas., Vic., W.A.) . . . . . **3. B. lechenaultii**
3. Abaxial surface of leaf blades glabrous or densely puberulous with hairs < 0.1 mm long, often obscured by resinous covering 4

4 Leaf blades lanceolate; fruits 10–12 mm long (N.S.W., Vic.) . . . . . **1. B. lanceolata**
4. Leaf blades narrow-elliptic to elliptic or narrow-obovate to obovate; fruits 5–9 mm long 5

5 Leaf blades narrow-obovate, 7–20 mm long, < 5 mm wide; ovaries 2-locular (N.S.W., S.A., Vic., W.A.) . . . . . **4. B. opaca**
5. Leaf blades narrow-elliptic to elliptic or narrow-obovate to obovate, 20–90 mm long, 5–30 mm wide; ovaries 3-locular (N.S.W., Qld, S.A., Tas., Vic., W.A.) . . . . . **6. B. viscosa**

1. Beyeria lanceolata Halford & R.J.F.Hend. **species nova** *B. viscosae* Miq. maxime affinis sed foliorum lamina lanceolata non angusto-elliptica usque ad obovata et fructibus longioribus (10–12 mm longis non 6–8 mm longis) differt. **Typus:** New South Wales. Neenah Creek, southern slopes of Nungatta Mt, *c.* 48 km SSW of Eden, 16 February 1984, *T.James 519 & M.Taylor* (holo: NSW; iso: MEL).

***Illustration*:** Jeanes (1999: 67, fig. 10j) as *Beyeria viscosa.*

Dioecious or occasionally monoecious, tall slender **shrubs or small trees** to 6 m high, resinous on young shoots, buds and adaxial leaf surface. Main trunk with fine flaky, reddish-brown bark. Young branchlets of unknown colour in fresh state, angular becoming terete with age, glabrous; older branchlets with grey, ± smooth bark. **Leaves** petiolate; petioles 3–6 mm long, glabrous, 3–6 pairs of sessile glands on adaxial face; blades lanceolate, 55–120 mm long, 6–16 mm wide, length:width ratio 7–15:1; adaxial surface glabrous and smooth; abaxial surface papillose and sparsely hairy with stellate hairs *c.* 0.7 mm across (obscured by resinous covering); base cuneate; margins flat or slightly recurved; apex acute; midvein impressed adaxially, abaxially prominently raised, rounded and glabrous; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate; male flowers axillary, solitary or in shortly pedunculate clusters of up to 4 flowers; female flowers axillary or terminal on a short axillary branchlet, solitary; peduncles up to 4 mm long, glabrous; bracts narrow-ovate, up to 3 mm long, rounded at apex, glabrous; pedicels ± angular, glabrous, stouter in female than in male flowers; calyx lobes 5, of unknown colour when fresh, glabrous; petals absent; disc obscure or absent. **Male flowers** with pedicels 7–9 mm long; calyx lobes broad-ovate, 3.2–4.5 mm long, 3–4 mm wide, concavo-convex, the margins erose, obtuse to rounded at apex; receptacle *c.* 2.5 mm across, glabrous; stamens 40; filaments ± erect, 0.1–0.3 mm long, glabrous, entire; anthers *c.* 1.3 mm long. **Female flowers** with pedicels

6–10 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, triangular to ovate, 2.5–3.5 mm long, 2–3.5 mm wide, the margins entire, rounded to obtuse at apex; ovary subglobose, ± trigonal, *c.* 2.5 mm long, glabrous, thickly resinous, 3-locular; style *c.* 0.2 mm long, glabrous; stigma calyptriform, 1.9–2.5 mm across, umbilicate, glabrous, with margins entire. **Fruits** subglobose, 10–12 mm long, 9–12 mm across, 2- or 3-seeded, glabrous, smooth; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 5.7–6.5 mm long (including caruncle), 4–4.8 mm across, 3–3.1 mm in thickness; testa dark brown or mottled dark brown and grey; caruncle *c.* 1.5 mm long, and 2.5 mm wide, yellowish-white. **Fig. 1.**

***Additional selected specimens examined*: New South Wales.** gully on the E side of Mt Wog Wog, Nalbaugh N.P., Dec 1985, *Albrecht 2343* (MEL, NSW); *c.* 4.8 km SSW of Nungatta Peak trig, Apr 1986, *Albrecht 2570* (MEL); Rock Flat Creek, Sep 1950, *Wakefield 4604* (MEL). **Victoria.** Mt Dandenong, Aug 1914, *Campbell s.n.* (MEL 114246); Dandenong Ranges below Mt Dandenong, May 1995, *Jeanes 176* (MEL); Sportsman Creek, Sep 1984, *Beauglehole ACB77347* (CANB, MEL); Haunted Stream, Oct 1977, *Gullan & Norris 208* (MEL); Bunga Creek, near Cunningham, Jan 1911, *St John s.n.* (MEL 622345); by Castleburn Creek on Dargo road, Sep 1979, *Walsh NGW130* (MEL); Mountain Creek, Deddick track crossing, 4.6 km NW of Mt Joan, Sep 1979, *Forbes 167* (MEL, NSW); Wulgulmerang, *c.* 70 km NNW of Orbost, Nov 1962, *Willis s.n.* (CANB, MEL 503120, NSW); Little River Gorge, *c.* 75 km N of Orbost, Nov 1968, *Willis s.n.* (MEL 114337); *c.* 0.5 km SW of Mt Merragunegin, Sep 1988, *Albrecht 3711* (MEL); Upper Genoa River, Oct 1948, *Wakefield 3186* (MEL); Upper Genoa River at junction with Yambulla Creek, Oct 1948, *Willis s.n.* (MEL 114244).

***Distribution and habitat*:** *Beyeria lanceolata* is known from Nungatta and Nalbaugh National Parks, southern New South Wales and in the Dandenong Ranges and East Gippsland, Victoria (**Map 2**). It grows on sheltered rocky hillslopes and in gullies in open eucalypt forest communities with rainforest understorey shrubs.

***Phenology*:** Flowers have been collected throughout the year, particularly from August to January, fruits from September to March.

***Affinities*:** *Beyeria lanceolata* is morphologically most similar to *B. viscosa* but differs by its lanceolate rather than narrow-elliptic to obovate leaf blades and its larger subglobose fruit which are 10–12 mm long compared with 6–8 mm long in *B. viscosa*.

***Etymology*:** The specific epithet is from the Latin *lanceolatus*, lanceolate, and alludes to the shape of the leaf blades in this species.

2. Beyeria lasiocarpa Müll.Arg., *Linnaea* 34: 59 (1865); *Beyeria lasiocarpa* Müll.Arg. forma *lasiocarpa*, Baill., *Adansonia* 6: 307 (1866). **Type:** [New South Wales.] Twofold Bay, *s.d.*, *F.Mueller* (holo: G-DC *n.v.* (microfiche IDC 800-73. 2454: II. 7); iso: MEL [4 sheets 114153, 114154, 114156, 114157], NSW 465094).

***Illustrations*:** Costermans (1986: 211); Jeanes (1999: 67, fig. 10k).

Dioecious or rarely monoecious, spreading, much-branched **shrubs** to 3 m high, thinly resinous on most parts. Young branchlets pale green and angular becoming grey and terete with age, glabrous; older branchlets with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 3–7 mm long, glabrous, with up to 5 pairs of sessile glands on adaxial face; blades narrow-elliptic, narrow-obovate or very narrow-ovate, 30–110 mm long, 7–20 mm wide, length:width ratio 5–15:1; adaxial surface glabrous and ± smooth; abaxial surface densely hairy with ± sessile, stellate hairs 0.1–0.2 mm across; base cuneate; margins slightly recurved; apex obtuse to acute or rounded, sometimes ultimately apiculate with extension from midrib; apiculum slender, < 0.2 mm long; midvein slightly impressed adaxially, abaxially raised, glabrous; secondary veins slightly impressed or obscure adaxially, abaxially slightly raised; tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, males axillary, in shortly pedunculate cymose clusters of up to 4 flowers or rarely solitary, females axillary or terminal on short axillary branchlets, solitary or rarely in shortly pedunculate cymose clusters of up to 3 flowers; peduncles up to 5 mm long, glabrous; bracts ± triangular, 1–3 mm long, acute at apex, ± glabrous; pedicels glabrous, stouter and longer on female flowers than on male flowers; calyx lobes 5, green, white puberulous abaxially, glabrous adaxially, the margins erose, rounded at apex; petals absent; disc ± a continuous ring, glabrous.

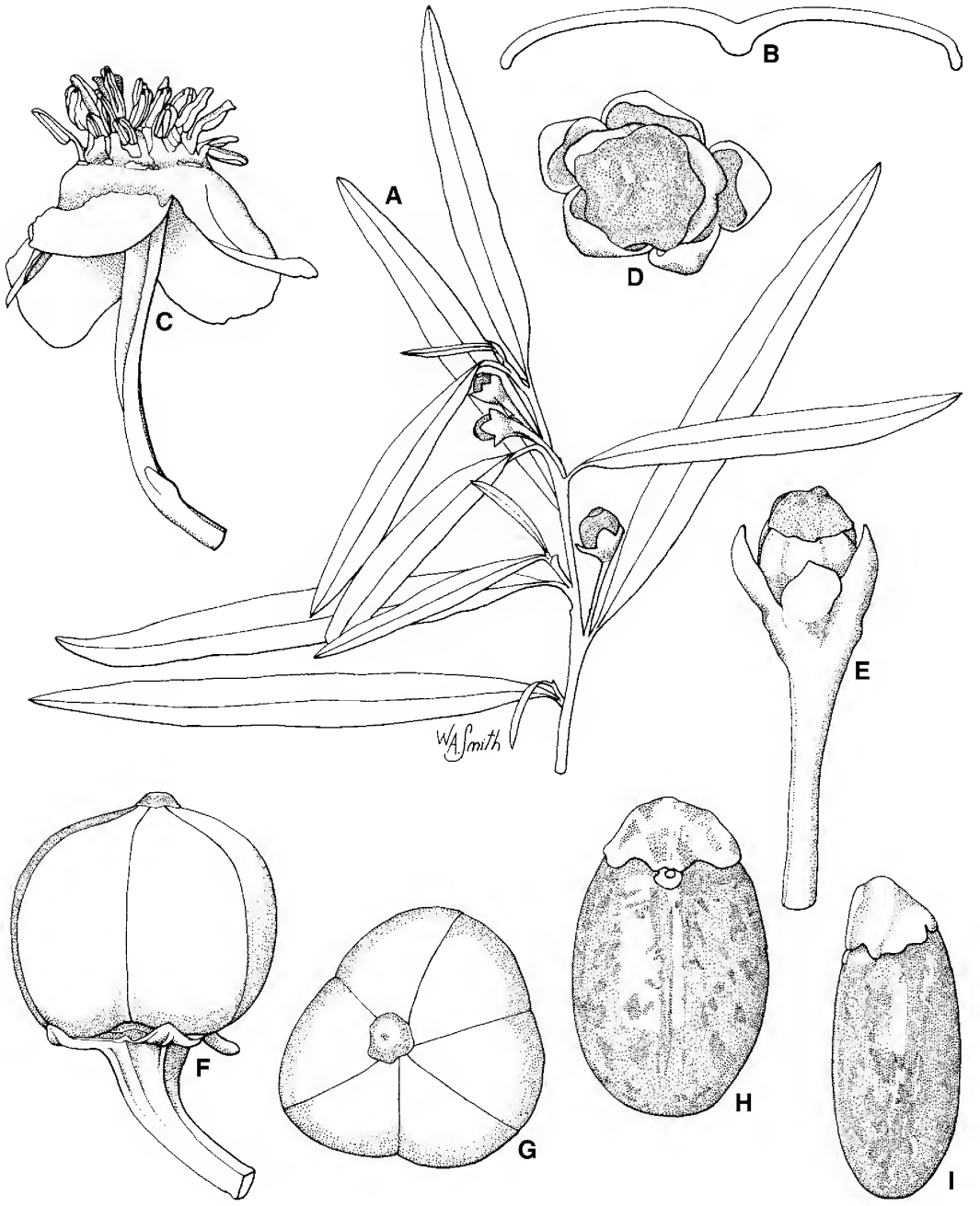

Fig. 1. ***Beyeria lanceolata***. A. branchlet with female flowers × 1. B. transverse section of leaf × 9. C. side view of male flower × 6. D. face view of female flower × 9. E. side view of female flower × 6. F. side view of fruit × 3. G. face view of fruit × 6. H. abaxial view of seed × 6. I. side view of seed × 60. A–E from *Jeanes 176* (MEL), F–I from *James 519 & Taylor* (NSW). Del. W.Smith.

Male flowers with pedicels 4–5 mm long; calyx lobes broad-ovate, 3–4 mm long, 3–4.5 mm wide; receptacle *c.* 3 mm across, stellate-tomentose; stamens 35–50; filaments erect, 1–1.5 mm long, glabrous or with a few simple hairs proximally; anthers 0.7–1 mm long. **Female flowers** with pedicels 7–15 (–20) mm long; calyx lobes spreading, ovate to broad-ovate or suborbicular, 3–5 mm long, 1.8–5.5 mm wide; ovary subglobose, ± trigonal, *c.* 3 mm long, densely hirsute, 3-locular; style up to 0.7 mm long, hirsute; stigma calyptriform, 3–5 mm across, umbilicate, glabrous, with margins irregularly toothed. **Fruits** depressed globose, 6–10 mm long, 7–10 mm across, 3-seeded, moderately hairy with simple ± erect hairs < 1.5 mm long; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 4–5.5 mm long (including caruncle), 2.3–3.7 mm across, 2–2.8 mm in thickness; testa black to dark brown; caruncle 0.6–1.5 mm long, 1.5–2.3 mm wide, light brown.

***Additional selected specimens examined*: Queensland.** Wide Bay District: Swain Peak, 7 km NW of Yandina, Mar 1993, *Bean 5808* (BRI); Gheerulla Falls, 5 km W of Mapleton, Nov 1990, *Bean 2686* (BRI). Moreton District: Neurum Creek, between Mt Delaney & Mt Archer, Mar 1989, *Forster PIF5006 et al.* (BRI); 4.3 km past bridge over Little Nerang Creek, Mudgeeraba to Springbrook road, Feb 1991, *Forster PIF7802 & Leiper* (BRI). **New South Wales.** Upper Guy Fawkes River, Boundary Creek, Jan 1992, *Glimour 7297* (BRI, MEL, NSW); Doyles River S.F., 88 km SE of Walcha, on the Oxley Highway, Aug 1985, *Foreman 988* (BRI, MEL, NE, NSW); Deua N.P., Diamond Creek, below 3rd waterfall, Jan 1994, *Taws 357 & Scott* (NSW); Carters Creek, Currowan S.F., NW of Batemans Bay, Dec 1973, *Pullen & Story 8747* (BRI, CANB, MEL, NSW, PERTH); North Brooman S.F., *c.* 4.8 km NW of Termeil, Nov 1973, *Pullen & Story 8625* (BRI, NSW); Pebbly Beach, 20 km NE of Batemans Bay, Dec 1969, *Briggs 3108* (NSW); Bemboka S.F., 2.6 km at 80° from Bemboka Peak, Mar 1992, *Telford 11564 & Crawford* (BRI, MEL, NSW); summit of Dr Georges Mt, 10 km NE of Bega on Tanja road, Jul 1995, *Jobson 3648* (MEL, NSW); Mt Dromedary, Dec 1962, *Adams 505* (BRI, MEL, NSW); Egan Peaks N.R., Sep 1984, *Albrecht 856* (MEL, NSW); 0.5 km upstream from Newtons Flat along creek, Nadgee N.R., Oct 1992, *Zich 199* (CANB, NSW). **Victoria.** Fainting Range track, 1.5 km E of Tambo River, Jan 1984, *Parkes EG147A* (MEL); *c.* 100 m N of junction between Mottle Range road and Monument track, 6 km SSE of Mt Tara, Jan 1984, *Parkes EG155* (BRI, MEL); between Snowy River at Wood Point and Long Point track, Aug 1979, *Walsh NGW178* (MEL); beside un-named creek falling N to Genoa River, 3.7 km NE from township, Oct 1991, *Walsh 3205* (BRI, MEL).

***Distribution and habitat*:** *Beyeria lasiocarpa* occurs in coastal and subcoastal areas of eastern Australia from Mapleton, south-eastern Queensland, southwards through New South Wales to Bairnsdale, East Gippsland, Victoria (**Map 3**). It grows in wet sclerophyll forest and moist gullies and shaded sites in dry sclerophyll forest communities and on rainforest margins.

***Phenology*:** Flowers and fruits have been collected throughout the year.

***Affinities*:** *Beyeria lasiocarpa* is similar to *B. viscosa* but can be distinguished by its densely hairy (rather than glabrous) ovary and fruits and the lack of resin on the abaxial surface of its leaf blades.

3. Beyeria lechenaultii (DC.) Baill., *Adansonia* 6: 307 (1866), ('*leschenaultii*'); *Hemistema* ('*Hemistemma*') *lechenaultii* DC., *Syst. Nat.* 414 (1817); *Beyeria lechenaultii* (DC.) Baill. forma *lechenaultii*, Baill., *Adansonia* 6: 307 (1866); *Beyeria lechenaultii* (DC.) Baill. var. *lechenaultii*, Grüning in A.Engler, *Pflanzenr.* H58: 70 (1913). **Type:** [South Australia.] Novo Holl. et ile St. Francois [St Francis Isles], *s.d.*, *Leschenault s.n.* (holo: G-DC *n.v.*, (microfiche IDC 800-73. 41: I. 1); iso: P 152760 (photo at BRI)).

Beyeria lechenaultii forma *elaeagnoides* Baill., *Adansonia* 6: 308 (1866), ('*eloeagnoides*'). **Type:** [Victoria.] near Lake King, February 1855, *F.Mueller s.n.* (lecto [here chosen]: MEL 114170).

Beyeria lechenaultii forma *myrtoides* Baill., *Adansonia* 6: 308 (1866). **Type:** [Victoria:] Cape Otway, *s.d.*, [*F.Mueller?*] (holo: MEL 114177).

Beyeria lechenaultii forma *pernettioides* Baill., *Adansonia* 6: 307–308 (1866). **Type:** [Victoria.] Portland, *s.d.*, *W.Allett s.n.* (lecto [here chosen]: MEL 114182).

Beyeria lechenaultii forma *rosmarinoides* Baill., *Adansonia* 6: 308 (1866); *Beyeria lechenaultii* var. *rosmarinoides* (Baill.) Grüning in A.Engler, *Pflanzenr.* H58: 70 (1913), *nom. superfl. et incor.* **Type:** [Victoria.] summit of Mount Ligar, *s.d.*, [*F.Mueller*?] (lecto [here chosen]: MEL 114186; isolecto: MEL 114179).

Beyeria lechenaultii forma *salsoloides* Baill., *Adansonia* 6: 308 (1866). **Type:** [Victoria.] N.W. Victoria, *s.d.*, *Mr Lockhart Morton s.n.* (holo: MEL 114181).

Beyeria lechenaultii forma *vaccinioides* Baill., *Adansonia* 6: 308 (1866). **Type:** [Victoria.] mouth of the Glenelg [River], *s.d.*, *W.Allett s.n.* (holo: MEL 114180).

Beyeria lechenaultii var. *latifolia* Grüning in A.Engler, *Pflanzenr.* H58: 71 (1913). **Type:** [Victoria.] Cape Otway, *s.d.*, [*F.Mueller?*] (lecto [here chosen]: MEL 114177).

Beyeria backhousei Hook.f., *Fl. Tasman.* 1: 339 (1857), (*'backhousii'*); *Beyeria ledifolia* var. *backhousei* (Hook.f.) Müll.Arg. in A.DC., *Prodr.* 15(2): 203 (1866), (*'backhousii'*); *Beyeria lechenaultii* var. *backhousei* (Hook. f.) Grüning in A.Engler, *Pflanzenr.* H58: 70 (1913), (*'backhousii'*). **Type:** [Tasmania.] Flinders Island, Bass Straits, *s.d.*, *R.C.Gunn 540* (syn: K); [Tasmania.] Flinders Island, *s.d.*, *J.Backhouse s.n.* (syn: K).

Beyeria drummondii Müll.Arg., *Linnaea* 34: 58–59 (1865); *Beyeria lechenaultii* var. *drummondii* (Müll.Arg.) Grüning in A.Engler, *Pflanzenr.* H 58: 70–71 (1913). **Type:** [Western Australia.] *s.loc.*, *s.d.*, *J.Drummond 214* (lecto [here chosen]: G-DC *n.v.* [microfiche IDC 800-73. 2454: II. 6]; isolecto: K, PERTH).

Calyptrostigma ledifolium Klotzsch in J.G.C.Lehmann, *Pl. Preiss.* 1: 176 (1845); *Beyeria ledifolia* (Klotzsch) Sond., *Linnaea* 28: 565 (1857); *Beyeria ledifolia* (Klotzsch) Sond. var. *ledifolia*, Müll.Arg. in A.DC., *Prodr.* 15(2): 203 (1866); *Beyeria lechenaultii* var. *ledifolia* (Klotzsch) Grüning in A.Engler, *Pflanzenr.* H58: 70 (1913). **Type:** [Western Australia.] in New Holland, *s.d.*, *J.Drummond s.n.* (holo: *n.v.*).

Beyeria ledifolia var. *angustifolia* Müll.Arg. in A.DC., *Prodr.* 15(2): 203 (1866). **Type:** [Western Australia.] at King George Sound, 1860, *Cuming s.n.* (holo: G-DC *n.v.* [microfiche IDC 800-73. 2455: I. 1].

Beyeria opaca var. *linearis* Benth., *Fl. Austral.* 6: 65 (1873), *Beyeria lechenaultii* var. *rosmarinoides* Ewart, *Fl. Victoria* 726 (1930), *nom. illeg.* **Type:** [South Australia.] near Adelaide, *s.d.*, *Blandowski s.n.* (lecto [here chosen]: K).

Beyeria viscosa var. *angustifolia* F.Muell. & Tate, *Trans. & Proc. Roy. Soc. South Australia* 16: 341 (1896). **Type:** [Western Australia.] Fraser Range, 23 October 1891, *R. Helms s.n.* (lecto [here chosen]: MEL 1560026; isolecto: NSW [3 sheets 257570, 257573, 257576,]).

Beyeria lechenaultii var. *latifolia* Ewart, *Fl. Victoria* 726 (1931), *nom. illeg. non* Grüning (1913). **Type:** not designated.

Beyeria lechenaultii forma *genuina* Baill., *Adansonia* 6: 307 (1866), *nom. inval.* [ICBN, Art. 24.3].

Beyeria ledifolia var. *genuina* Müll.Arg. in A.DC., *Prodr.* 15(2): 203 (1866), *nom. inval.* [ICBN, Art. 24.3].

Beyeria lechenaultii var. *genuina* Grüning in A.Engler, *Pflanzenr.* H58: 70 (1913), *nom. inval.* [ICBN, Art. 24.3].

***Illustrations*:** Cunningham *et al.* (1982: 453); Costermans (1986: 211); Weber (1986: 742, fig. 398a); Jeanes (1999: 67, fig. 10h); Corrick & Führer (2000: 81).

Dioecious or rarely monoecious, open to dense, spreading to erect **shrubs** up to 2 m high, usually resinous on most parts. Young branchlets pale green when fresh, angular becoming terete with age, with resinous longitudinal ridges, puberulous between ridges but usually obscured by resinous covering; older branchlets with grey or pale brown, ± tessellated bark. **Leaves** petiolate; petioles 1–3 mm long, ± glabrous, glands absent; blades linear to narrow-oblong, narrow-obovate to obovate, narrow-elliptic to elliptic or rarely narrow-ovate, 9–40 mm long, 0.9–15 mm wide, length:width ratio 2–25:1; adaxial surface glabrous and smooth, usually thickly resinous; abaxial surface densely woolly with crispate hairs up to 1 mm long; base cuneate, obtuse or rounded; margins flat or slightly to strongly recurved sometimes to midrib concealing abaxial leaf surface; apex acute, rounded to truncate, emarginate or rarely obcordate, sometimes ultimately apiculate with extension from midrib; apiculum stout, up to 0.5 mm long,

bent upward; midvein obscure or slightly impressed adaxially, abaxially prominently raised, rounded and glabrous; secondary and tertiary veins obscure; marginal glands occasionally present at base of blade, 1 or 2 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, males axillary, solitary or in shortly pedunculate clusters of up to 3 flowers, females axillary or terminal on short axillary branchlet, solitary; peduncles up to 1 mm long, resinous; bracts narrow-ovate, up to 3 mm long, acute at apex, ± glabrous; pedicels ± angular, puberulous but usually concealed by resinous covering, stouter on female than on male flowers; calyx lobes 5(rarely 4 in male flowers), pale green; petals absent or rarely present in male flowers as small rudimentary lobes; disc a continuous glandular ring, ± fleshy, glabrous. **Male flowers** with pedicels 3.5–10 mm long; calyx lobes broad-ovate or suborbicular, 1–3.2 mm long, 1–3 mm wide, concavo-convex, puberulous abaxially medially, glabrous adaxially, the margins erose, obtuse to rounded or acute at apex; receptacle 1–1.5 mm across, densely hairy or with a few scattered hairs; stamens 10–60; filaments ± erect, 0.1–0.3 mm long, glabrous, entire; anthers 0.3–1 mm long. **Female flowers** with pedicels 2–10 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, triangular to ovate, 1–2 mm long, 0.8–1.5 mm wide, puberulous abaxially, glabrous adaxially, the margins entire, acute, rounded to obtuse at apex; ovary subglobose and ± trigonal or laterally compressed, 1.2–2 mm long, glabrous or sometimes with scattered stellate hairs, thickly resinous, 3(rarely 2)-locular; style 0.3–0.7 mm long, glabrous; stigma calyptriform, 1–1.8 mm across, shallowly umbilicate, glabrous, with margins erose. **Fruits** ellipsoid-subglobose, rarely 3-lobate, 4.5–8 mm long, 3.8–7 mm across, 2- or 3-seeded, glabrous, ± smooth; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 3.5–6.8 mm long (including caruncle), 2–4 mm across, 1.5–3.3 mm in thickness; testa dark brown or mottled dark and light brown; caruncle 0.7–1.3 mm long, 1.2–2.6 mm wide, yellowish-white.

***Distribution and habitat*:** *Beyeria lechenaultii* occurs in southern Australia south of latitude 30° from near Perth, Western Australia eastward through South Australia to the Griffith area, New South Wales, Lake Entrance, Victoria, Bass Strait Islands and the north-west coast of Tasmania, with a disjunct population recorded in the Pilliga area, New South Wales (**Map 4**). In inland areas it mainly grows in shrubland, mallee, and open woodland communities, in sandy loams or red earths, on undulating plains or occasionally in mountain ranges, gorges or associated with rocky outcrops. In coastal areas it grows in heathland and shrubland communities in sandy soils on coastal dunes or rocky headlands.

***Phenology*:** Flowers have been recorded throughout the year, particularly from July to December, fruits in March and April and from July to January.

***Typification*:** In the protologue of *Beyeria lechenaultii* forma *elaeagnoides*, Baillon (1866) cited two collections '*Wilhelmi*, Port Lincoln (herb. F.Muell.!)' and '*F.Mueller*, prope Lake King Island, in virgultis (herb.!)'. Two collections, which are considered as syntypes of the name *B. lechenaultii* forma *elaeagnoides*, have been located amongst material loaned to BRI from MEL [114170 and 114208]. The sheet 114170 has been selected as lectotype because it is part of original material and has morphology that agrees with the brief description in Baillon's protologue of this forma.

In the protologue of *Beyeria lechenaultii* forma *pernettioides*, Baillon (1866) cited four collections from F.Mueller's herbarium (now MEL). Four collections [114174, 114182, 114195 and 114204] which are considered to be syntypes and one collection [2062920] considered to be a possible isosyntype have been located amongst material on loan to BRI from MEL. The collection made by *Allett* from Portland [114182] is here selected as the lectotype because it is the most ample and best preserved of the specimens and has morphology that agrees with the brief description given in Baillon's protologue of this forma.

In the protologue of *Beyeria lechenaultii* forma *rosmarinoides*, Baillon (1866) cited some 12 collections, two from Preiss's herbarium and ten from F. Mueller's herbarium (now MEL). The Mueller collection labelled "summit of Mount Ligar" [MEL 114186] is here selected as the lectotype of this name because it is part of the original material and has morphology that agrees with the brief description given in Baillon's protologue of this forma.

In the protologue of *Beyeria lechenaultii* var. *latifolia*, Grüning (1913) cited two specimens namely 'without location details, (*F. Mueller* !)' and 'Victoria. Sorrento, (*Weindorfer* !)'. He also made reference to four names, '*Beyeria lechenaultii* var. *β-ε* Baill.' (= *Beyeria lechenaultii* forma *pernettioides* Baill., *Beyeria lechenaultii* forma *elaeagnoides* Baill., *Beyeria lechenaultii* forma *myrtoides* Baill. and *Beyeria lechenaultii* forma *vaccinioides* Baill.). We have been unable to locate either of the two specimens cited. To fix the application of Grüning's *Beyeria lechenaultii* var. *latifolia*, the type of *Beyeria lechenaultii* forma *myrtoides* Baill., is here selected as lectotype of Grüning's name because of the material located it best fits the description given in Grüning's protologue of this variety.

In the protologue of *Beyeria drummondii*, Müller (1865) cited two James Drummond collections from Western Australia, namely "In Nova Hollandia austre-occidentali ad Swan River (*Drummond n. 13*! *214*!)". We have been unable to locate material of *Drummond n. 13* in loans from K or PERTH and it is not recorded on the microfiche of De Candolle's herbarium. However, we have seen on the microfiche of De Candolle's herbarium (G-DC) what we considered to be the syntype *Drummond n. 214*. As well we have located two isosyntypes amongst material loaned to BRI from PERTH and K. The collection (*Drummond 214*) that is located at G-DC is here selected as the lectotype of Müller's name because it is part of original material and has morphology that agrees with the description in Müller's protologue of this species.

In the protologue of *Beyeria viscosa* var. *angustifolia*, Mueller & Tate (1896) cited a single collection from Fraser Range collected by R. Helms on the Elder Expedition in the north-west of South Australia and across the Great Victoria Desert of Western Australia. We have located three duplicates (one at MEL and two at NSW). The MEL specimen [1560026] is here selected as the lectotype of this Mueller name because it is part of original material and has morphology that agrees with the description in Mueller's protologue of this species.

In the protologue of *Beyeria opaca* var. *linearis*, Bentham (1873) cited two collections, namely 'Alps on the Macalister, *F.Mueller*; near Adelaide, *Blandowski'*. A single sheet containing both specimens was located amongst material loaned to BRI from K. The specimen collected by Blandowski (on the left of the sheet) is here selected as the lectotype of Bentham's name because it has morphology that agrees with the protologue and is the more ample of these two collections.

***Affinities*:** *Beyeria lechenaultii* is morphologically most similar to *B. subtecta* but differs in having generally larger leaves (9–40 mm long × 0.9–15 mm wide compared with 4–10 mm long × 0.8–1.6 mm wide) and fruits (4.5–8 mm long × 3.8–7 mm across compared with *c.* 3 mm long and 2.5 mm across), and female flowers with an entire rather than a bipartite stigma.

***Notes*:** In the past, *Beyeria lechenaultii* has been confused with *B. sulcata* var. *sulcata* in the western part of its range but is easily distinguished from this taxon by having apetalous flowers or petals reduced to small rudimentary lobes compared with petalous flowers in *B. sulcata* var. *sulcata*.

This species, as circumscribed here, varies considerably in the length and width of its leaves. This variation has led several authors in the past to formally describe many infraspecific and specific taxa (Hooker 1857; Müller 1865; Baillon 1866; Grüning 1913). Much more material has since been collected and although the extreme forms within this species differ considerably from each other, much of the morphological variation appears

to intergrade, making it difficult in assigning material to one or other of them. For this reason we have not formally recognised these variants. However, the more notable variants are discussed below.

'Typical variant' *sens. lat.*

Leaf blades linear to narrow-oblong or rarely narrow-obovate, mostly 9–27 mm long, 1.5–3.5 mm wide, the margins strongly recurved almost to midrib or sometimes to midrib concealing abaxial leaf surface, apex mostly rounded to truncate. **Male flowers**: calyx lobes 5, 1.5–3.2 mm long, stamens 20–60. **Female flowers**: ovary 3-locular. **Fruits** 6–8 mm long.

This is the most widespread variant and occurs from York, Western Australia, eastwards through South Australia to New South Wales and north-western Victoria.

***Selected specimens examined*: Western Australia.** Yallari Reserve [Yallarin], Jun 1925, *Franks 43* (PERTH); *c.* 35 km SE of Coolgardie, on road to Norseman (Coolgardie – Esperance Highway), Sep 1988, *Henderson H3165* (BRI); 3.5 miles [*c.* 6 km] E of Eucla, Oct 1966, *George 8511* (NSW, PERTH); McPherson Rock, 31 km S of Norseman, Aug 1975, *Crisp 972* (CANB, PERTH); 27 km S from Balladonia towards Mt Ragged, Sep 1983, *Taylor 1525 & Ollerenshaw* (CANB, MEL); near Point Dover, Jul 1967, *Wilson 5946* (PERTH). **South Australia.** *c.* 2 km N of New West Bore, Bibliando Station, Apr 1974, *Crisp 733* (AD, CANB); Ceduna, Sep 1968, *Canning WA/68 2324* (CANB); 3 Calpatanna Waterhole Conservation Park, *c.* 26 km SSE of Streaky Bay, Nov 1989, *Davies 1449 & Hadlow* (MEL); Bay of Shoals, Kangaroo Island, Aug 1984, *Weston 6* (CANB); by Chauncey's Line, *c.* 5 km SE of Harriet Hill and *c.* 18 km SW of Murray Bridge, Oct 1958, *Schodde 911* (AD). **New South Wales.** Pilliga Scrub, Aug 1953, *Jordan s.n.* (AD 966071380); *c.* 2 km N of Goolgowi towards Merriwagga, Oct 1989, *Henderson & Turpin H3323* (BRI, NSW); 4 km W of Kamarah, Nov 1975, *Crisp 1508* (AD, CANB); 2.3 km WNW of Kamarah on the Ardlethan – Griffith road, Apr 1988, *Dalby 88/13 et al.* (MEL, NSW). **Victoria.** Sunset Country, Millewa South Bore track, *c.* 0.3 km S of Bore to first major dune crest, Aug 1986, *Lucas 207* (MEL); Big Desert, 8 km S of Murrayville on Nhill road, Oct 1979, *Corrick 6389* (AD, MEL); 30.6 km SE of Walpeup on road to Patchewollock, Oct 1980, *Corrick 6701 et al.* (AD, CANB, MEL); 9 km W of Swan Hill on road to Sea Lake, Sep 1989, *Henderson & Turpin H3270* (BRI); 2.7 km NE of Dimboola, Aug 1995, *Jobson 3715* (BRI, MEL).

'Broad-leafed variant'

Leaf blades narrow-elliptic to elliptic, narrow-obovate to obovate or rarely narrow-ovate, mostly 10–30 mm long, 2.5–13 mm wide, the margins flat or slightly recurved, apex obtuse, acute or rounded, rarely emarginate, sometimes ultimately apiculate with extension from midrib. **Male flowers**: calyx lobes 5, 2.5–3 mm long, stamens 20–35. **Female flowers**: ovary 3-locular. **Fruits** 6–7 mm long.

Occurs mostly in coastal areas from Fowlers Bay, South Australia, east to Lakes Entrance, Victoria, and onto the Bass Strait Islands and the north-west corner of Tasmania. Also occurs on Mt Arapiles and Mitre Rock in north western Victoria.

The following names placed in synonymy of *Beyeria lechenaultii* are applicable to this variant: *B. lechenaultii* forma *elaeagnoides* Baill., *B. lechenaultii* forma *myrtoides* Baill., *B. lechenaultii* forma *pernettioides* Baill., *B. lechenaultii* forma *vaccinioides* Baill., *B. lechenaultii* var. *latifolia* Grüning and *B. backhousei* Hook.f.

***Selected specimens examined*: South Australia.** Cape Wiles, Mar 1960, *Filson 1608* (MEL); far SW tip of Yorke Peninsula, Innes N.P., Sep 1989, *Smith 89/17* (MEL); Beachport, Jan 1963, *Womersley 10* (MEL, NSW). **Victoria.** Mitre Rock, Sep 1996, *Ross 3791* (MEL); Mt Arapiles, Nov 1968, *Beauglehole ACB29646* (MEL); Kalimna Heights, Clara Street, Dec 1995, *Stephens 14* (MEL); Glenelg River mouth track to near Ocean Beach carpark, Dec 1983, *Forbes 1925 & Beauglehole* (MEL); Port Campbell N.P., Oct 1966, *Finck & Beauglehole ACB21640* (MEL, NSW); Otways, Parker River, *c.* 100 m upstream from mouth, Jan 1991, *Albrecht 4696* (MEL); Cape Schanck coastal park, Nov 1982, *Beauglehole ACB71544 & Elmore* (MEL). **Tasmania.** King Island, Golf Links, Currie Harbour, Jan 1968, *Cameron s.n.* (HO 27189); Erith Island, Kents Group, Bass Strait, Dec 1987, *Whinray 9030* (MEL); Prime Seal Island, Furneaux Group, Aug 1972, *Whinray 1473* (MEL); W end of Trouser Point, Flinders Island, Oct 1985, *Collier 782* (HO); Cape Barren Island, Furneaux Group, Oct 1973, *Whinray 606* (MEL); Australian Point, Apr 1984, *Moscal 7874* (HO, MEL); Temma, Feb 1976, *Richley s.n.* (HO 27722).

'Narrow-leafed variant'

Leaf blades linear, mostly 10–30 mm long, 0.9–1.2 mm wide, the margins strongly recurved to midrib concealing abaxial leaf surface, apex obtuse, rounded or rarely obcordate. **Male flowers**: calyx lobes 4 or

5, 1–1.7 mm long, stamens 10–24. **Female flowers**: ovary 2- or 3-locular. **Fruits** 4.5–5 mm long.

Occurs in coastal or near coastal areas from Beaufort Inlet eastward to near the Oldfield River in Western Australia.

This variant has generally shorter and narrower leaves as well as generally smaller male flowers, occasionally 2-locular ovaries and generally smaller fruit than the other variants *Newbey 1245 & 11231* (both PERTH). Two collections (*Newbey 1245* (PERTH) and *Newbey 11231* (PERTH)), which are relatively atypical for this variant, have leaves with obcordate or emarginate apices.

The names *Beyeria drummondii* Müll. Arg. and *B. lechenaultii* var. *drummondii* (Müll.Arg.) Grüning, placed above in the synonymy of *B. lechenaultii*, are applicable to this variant.

***Selected specimens examined*: Western Australia.** Beaufort Inlet, Feb 1964, *Newbey 1245* (PERTH); junction of Twertup Creek & Fitzgerald River, Fitzgerald River N.P., Aug 1985, *Newbey 10946* (BRI, PERTH); inlet S of Fitzgerald, Jul 1971, *Aplin 4787* (PERTH); Phillips River, 19 km from Ravensthorpe on Ravensthorpe – Albany road, Oct 1966, *Muir 4150* (MEL); 30 km SW of Ravensthorpe, Oct 1986, *Newbey 11231* (PERTH); Quoin Head Campground, Fitzgerald River N.P., W of Hopetoun, Nov 1996, *Lepschi BJL3194 & Lally* (BRI, MEL); Fitzgerald River N.P., *c.* 50 m NW of Quoin Head campsite, Apr 2001, *Hislop 2204* (BRI); Fitzgerald River, Sep 1948, *Gardner 9251* (PERTH); Coppermine Creek, Fitzgerald River N.P., Oct 1970, *Royce 9291* (PERTH); Oldfield River at crossing of the Esperance – Ravensthorpe road, *c.* 105 km W of Ravensthorpe, Oct 1968, *Eichler 20225*, *20226* (PERTH).

4. Beyeria opaca F.Muell., *Trans. Philos. Soc. Victoria* 1: 16 (1855); *Beyeria opaca* F.Muell. var. *opaca*, Benth., *Fl. Austral.* 6: 65 (1873). **Type:** [Victoria.] Murray, *s.d.*, *F.Mueller s.n.* (lecto [here chosen]: MEL 2062921; isolecto: K).

Beyeria opaca var. *latifolia* J.M.Black, *Fl. S. Austral.*, 1st edn, 357 (1924). **Type:** [South Australia.] Ooldea, January 1917, *s.coll.* (holo: AD 98046056; iso: AD 966050860).

Beyeria opaca var. *typica* Grüning in A.Engler, *Pflanzenr.* H58: 69 (1913), *nom. inval.* [ICBN, Art. 24.3].

***Illustrations*:** Cunningham *et al.* (1982: 453); Weber (1986: 742, fig. 398b); Jeanes (1999: 67, fig. 10i); Corrick & Führer (2000: 81).

Dioecious, spreading, much-branched **shrubs** to 1 m high, resinous on most parts. Young branchlets pale green and angular becoming terete with age, glabrous; older branchlets with grey to black bark. **Leaves** petiolate; petioles 1–1.5 mm long, glabrous, glands absent; blades narrow-obovate, 7–20 mm long, 1.2–4 mm wide, length:width ratio 5–8:1; adaxial surface glabrous and ± smooth, resinous; abaxial surface papillose and hairy with ± sessile, stellate hairs *c.* 0.05 mm across (obscured by resinous covering); base cuneate; margins ± flat or slightly recurved; apex rounded; midvein faintly impressed adaxially, abaxially faintly raised, glabrous and resinous; secondary and tertiary veins obscure; marginal glands occasionally present at base of blade, 1 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, males axillary, solitary, females axillary or terminal on short axillary branchlet, solitary; bracts ± triangular, 1.3–1.5 mm long, acute at apex, glabrous; pedicels ± glabrous, stouter on female flowers than on male flowers; calyx lobes 5, glabrous, concavo-convex, acute to rounded at apex; petals absent in male flowers, absent or rudimentary in female flowers; disc obscure or absent. **Male flowers** with pedicels 4–7 mm long; calyx lobes yellowish green, reddened in parts, suborbicular or ovate, 1.5–3.5 mm long, 2–2.8 mm wide, the margin erose; receptacle 1–1.5 mm across, glabrous; stamens 25–40; filaments erect, 0.8–1 mm long, glabrous; anthers 0.7–0.9 mm long. **Female flowers** with pedicels 1.5–4 mm long; calyx lobes green, ± appressed to and enclosing gynoecium apart from stigma, ovate, 0.9–1.8 mm long, 0.7–1.5 mm wide, the margin entire; petals when present, oblong, < 0.2 mm long; ovary ellipsoid, 0.8–1 mm long, glabrous or densely hairy distally, 2-locular; style ± obsolete; stigma calyptriform, *c.* 1 mm across, shallowly umbilicate, glabrous, with margins ± entire. **Fruits** ellipsoid, laterally compressed, 4.5–8.5 mm long, 3.7–7 mm across, 2.5–4.5 mm in thickness, 1- or 2-seeded, glabrous, ± smooth; persistent calyx *c.* one fifth the length of mature fruit. **Seeds**

ellipsoid, dorsi-ventrally compressed, 3.5–5 mm long (including caruncle), 2.2–3 mm across, 2–2.7 mm in thickness; testa mottled light to dark brown; caruncle *c.* 1 mm long and 1.5 mm wide, creamy-white.

***Additional selected specimens examined*: Western Australia.** *c.* 50 m SW of Bushfire Rock road, 46.5 km E of Hyden, Sep 1991, *Mollemans & Mollemans 4624* (BRI); 76.9 km E of Norseman on Eyre Highway, Aug 1995, *Cranfield 10049* (BRI, PERTH). **South Australia.** 1 mile [*c.* 1.6 km] S of Maralinga, Aug 1956, *Forde 466* (MEL); Lake Tallacootra, Oct 1983, *Weber 8191* (BRI); 30.5 miles [*c.* 49 km] from Whyalla towards Kimba, Aug 1968, *Canning 2174* (CANB; NSW); 18 km W of Walker Flat, Sep 1979, *Spooner 6530* (AD, NSW); 26 km NE of Blanchetown on Waikerie road, Oct 1975, *Haegi 689* (AD); turnoff to Loxton, just before Alawoona on Alawoona to Paruna road, Oct 1989, *Henderson & Turpin H3320* (BRI); *c.* 9 km N of Overland Corner, Sep 1971, *Donner 3697* (AD, NSW). **Victoria.** *c.* 11.7 km along road which runs W of the Sunset Tank – Merrinee road, Sep 1980, *Short 1194 & Corrick* (AD, CANB, MEL, NSW); 3 km W of abandoned railway, near Rocket Lake, Oct 1977, *Crisp 3321* (CANB, MEL); 36 miles [*c.* 58 km] W of turnoff, 14 miles [*c.* 23 km] N of Birthday Tank, Sunset Country, Sep 1965, *Filson 7449* (AD, MEL, NSW); Kulkyne S.F., W of the old Calder Highway, 2 miles [*c.* 3 km] N of the Lake Hattah to Hattah Station road, Nov 1958, *Aston 152* (MEL); *c.* 15 km S of Hattah, heading towards Ouyen on Calder Highway, Sep 1989, *Henderson & Turpin H3268* (BRI); Big Desert, 44 km N of Broken Bucket bore, Oct 1979, *Corrick 6360* (MEL). **New South Wales.** 14 miles [*c.* 22 km] from Mt Hope to Euabalong, Sep 1969, *Dunlop 1554* (CANB); 26 miles [*c.* 42 km] from Lake Cargelligo towards Mt Hope, Sep 1966, *Phillips s.n.* (AD 97031105, CANB [CBG016390]); *c.* 22 km E of Rankins Springs, Oct 1972, *Jackson 2153* (AD, MEL); Pulletop N.R., *c.* 20 km SW of Rankins Springs, Nov 1975, *Crisp 1454* (AD, CANB); *c.* 17 km S of Weethalle on Weethalle – Barellan road, Sep 1989, *Henderson & Turpin H3258* (BRI).

***Distribution and habitat*:** *Beyeria opaca* occurs in southern Australia, from Whyalla, south-eastern South Australia, eastward to Weethalle and Lake Cargelligo, New South Wales and south to Swan Hill in Victoria, with disjunct populations near Hyden and Norseman in southern Western Australia and near Maralinga, Lake Tallacootra and the Gawler Range, south-western South Australia (**Map 5**). It grows in mallee communities on red sandy soils on sandy flats or dunefields.

***Phenology*:** Flowers have been collected throughout the year, particularly from August to November, fruits in March, April and from June to November.

***Affinities*:** *Beyeria opaca* resembles the narrow leaf forms of *B. viscosa* but can be distinguished by its smaller habit (shrub to 1 m high compared with shrub to small tree to 5 m high) and leaves (7–20 mm long × 1.2–4 mm wide compared with 20–90 mm long × 5–30 mm wide), 2-locular ovary, and generally fewer stamens in each male flower.

***Typification*:** In the protologue of *Beyeria opaca*, Mueller (1855) did not cite any particular collection but listed a number of localities "In the Mallee scrub, between Lake Lalbert, Lake Tyrrell, and the Murray River". Four collections which we consider part of the original material that Mueller used to draw up his description of this species have been located amongst material loaned to BRI from MEL and K. Two of the MEL sheets [114214 and114225] are labelled "Beyeria viscosa var opaca, 'Mallee Scrub". The other MEL sheet [2062921, ex herb. Sonder] and the K sheet are labelled "Beyeria opaca, Murray, Mueller". The MEL sheet [2062921] is chosen as the lectotype of this name because it is an ample specimen and has morphology that agrees with the description in the protologue.

5. Beyeria subtecta J.M.Black, *Fl. S. Austral.* 357–358 (1924). **Type:** [South Australia.] Cygnet River, Kangaroo Island, 20 October 1908, *H.H.D.Griffith s.n.* (holo: AD 9831247).

***Illustration*:** Barker & Dashorst (1984: 139).

Dioecious, much-branched **shrubs** to 0.6 m high, resinous on most parts. Young branchlets of unknown colour when fresh, angular becoming terete with age, puberulous between resinous longitudinal ridges; hairs stellate, sessile, *c.* 0.1 mm across, sometimes obscure by resin; older branchlets with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 0.5–1.5 mm long, glabrous, glands absent; blades linear or very narrow-obovate, 4–10 mm long, 0.8–1.6 mm wide, length:width ratio 5–7:1; adaxial surface glabrous and ± smooth, resinous; abaxial surface densely hairy with ± sessile, stellate hairs *c.* 0.1 mm across; base cuneate; margins recurved to midrib usually concealing abaxial leaf surface; apex obtuse to rounded, ultimately apiculate with extension from

midrib; apiculum slender, up to 0.4 mm long; midvein slightly impressed adaxially, abaxially raised, flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands rarely present at base of blade, 1 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, axillary, solitary; bracts oblong, 0.6–1.2 mm long, acute at apex, ± glabrous; pedicels stellate pubescent, stouter on female flowers than on male flowers; calyx lobes 5(rarely 4 in male flowers), ovate, ± flat, stellate-puberulous abaxially, glabrous adaxially, the margins entire; petals absent; disc a continuous ring, ± fleshy, glabrous. **Male flowers** with pedicels 1.5–3 mm long; calyx lobes light green to yellow or white, reddened in parts, 1.5–2.2 mm long, 1.2–1.4 mm wide, acute, obtuse or rounded at apex; receptacle *c.* 0.4 mm across, glabrous; stamens 15–25; filaments erect to spreading, 0.1–0.3 mm long, glabrous; anthers 0.4–0.6 mm long. **Female flowers** with pedicels up to 1 mm long; calyx lobes green, ± appressed to and enclosing gynoecium apart from stigma, 1.6–2.1 mm long, 0.7–0.8 mm wide, acute at apex; ovary ellipsoid, dorsi-ventrally compressed, *c.* 1 mm long, sparsely to densely stellate-puberulous (usually obscured by resinous covering), 2-locular; style *c.* 0.4 mm long, sparsely to densely stellate puberulous (usually obscured by resinous covering); stigma bipartite; lobes ± oblong, *c.* 1 mm long, glabrous, appressed to ovary, with margins entire. **Fruits** ellipsoid, *c.* 3 mm long and 2.5 mm across, 1-seeded, sparsely stellate hairy distally; persistent calyx *c.* half the length of mature fruit. Seed not seen.

***Additional specimens examined*: South Australia.** along side of road heading ENE towards Point Morrison near junction with Kingscote to Penneshaw road, Oct 1983, *Davies & Bushman 15* (MEL); Beyeria N.P., Kangaroo Island, Apr 1991, *Spencer 1057 & Worboys* (MEL); 700 m S of six way road intersection, 12.5 km SE of Cygnet River township on Kingscote to Penneshaw road, Oct 1983, *Davies & Bushman 9* (BRI, CANB); 700 m ENE of road intersection NE of Dead Horse Lagoon, Kangaroo Island, Oct 1983, *Davies & Bushman 4* (CANB); road junction 2.3 km NW of intersection N of Kiowie Station on Kingscote to Penneshaw road, Oct 1983, *Davies & Bushman 2* (MEL); 5 miles [*c.* 8 km] from American River, towards Kingscote, Kangaroo Island, Sep 1965, *Phillips SA/65 776* (CANB); proposed American River Tip, top of Muston Hill, 9.7 km E of American River, Aug 1984, *Weston 92* (CANB).

***Distribution and habitat*:** *Beyeria subtecta* is endemic to Kangaroo Island, South Australia (**Map 6**). It grows in *Eucalyptus cneorifolia* and *Melaleuca uncinata* heathland and mallee on clay on a laterite substrate and in *Casuarina* shrubland and mallee on white sand with ironstone over clay intruded with limestone.

***Phenology*:** Flowers have been collected from August to October, fruits in October.

***Affinities*:** *Beyeria subtecta* is morphologically most similar to *B. lechenaultii* but differs in having generally smaller leaves (4–10 mm long × 0.8–1.6 mm wide compared with 9–40 mm long × 0.9–15 mm wide) and fruits (*c.* 3 mm long and 2.5 mm across compared with 4.5–8 mm long × 3.8–7 mm across), and female flowers with a bipartite rather than an entire stigma.

***Notes*:** *Beyeria subtecta* is listed as 'Vulnerable' in the South Australian threatened species list under the *National Parks and Wildlife Act (South Australia) 1972.*

6. Beyeria viscosa Miq., *Ann. Sci. Nat. Bot.* ser. 3, 1: 350–352, *t.* 15 (1844); *Beyeria viscosa* Miq. var. *viscosa*, Müll.Arg. in A.DC., *Prodr.* 5(2): 202 (1866). **Type:** [Western Australia] in colliculis arenosis insulae Rottenest, N.Holl., 19 August 1839, *L.Preiss 2387* (holo: U 19718; iso: G-DC *n.v.* [microfiche IDC 800-73. 2454: III. 1], LD 99/018-0879, MEL [3 sheets 2062937 ex Sonder Herb., 2062918 ex Sonder Herb., 114267 ex Steetz Herb.], P 275782).

Beyeria viscosa var. *amoena* Müll.Arg. in A.DC., *Prodr.* 15(2): 202 (1866). **Type:** southern Australia, 1863, *F.Mueller s.n.* (lecto [here chosen]: G-DC *n.v.* [microfiche IDC 800-73. 2454: III. 7]; iso?: K).

Beyeria viscosa var. *latifolia* Benth., *Fl. Austral.* 6: 65 (1873). **Type:** Western Australia. Swan River to Cape Richer[Riche], *s.d.*, *J.Drummond 5th coll. n. 217* (holo: K [ex herb. Benth.]; iso: K [ex herb. Hook.]).

Beyeria viscosa var. *minor* Müll.Arg. in A.DC., *Prodr.* 5(2): 202 (1866). **Type:** [New South Wales.] interior west from Wellington Valley, 1825, *A.C.Cunningham s.n.* (holo: G-DC *n.v.* [microfiche IDC 800-73. 2454: III. 6]).

Calyptrostigma oblongifolium Klotzsch in J.G.C.Lehmann, *Pl. Preiss.* 1(2): 176 (1845); *Beyeria oblongifolia* (Klotzsch) Sond., *Linnaea* 28: 564 (1857); *Beyeria viscosa* var. *oblongifolia* (Klotzsch) Müll.Arg. in A.DC., *Prodr.* 15(2): 202 (1866). **Syntypes:** [Australia.] Nova Hollandia, *s.d.*, *s.coll.* (B-Willd. 17848 fol. 1 *n.v.* [microfiche IDC 7440. 1291: III. 4]); *s.loc.*, *s.d.*, *Labillardière s.n.* (B-Willd. 17849 fol. 1 and 2. *n.v.* [microfiche IDC 7440. 1291: III. 6,7]).

Croton viscosus Labill., *Nov. Holl. Pl.* 2: 72–73, t. 222 (1806), ('*viscosum*'); *Calyptrostigma viscosum* (Labill.) Klotzsch in J.G.C.Lehmann, *Pl. Preiss.* 1(2): 176 (1845). **Type:** [Australia.] Nova Hollandia, ora austro-occidentalis, *s.d.*, *Labillardière s.n.* (lecto [here chosen]: FI 165908 *n.v.* [transparency at BRI]).

Beyeria viscosa var. *obovata* C.T.White, *Proc. Roy. Soc. Queensland* 50: 86 (1939). **Type:** Queensland. Mitchell District. Torrens Creek, 19 March 1933, *C.T.White 8731* (holo: BRI; iso: A *n.v.*, BRI, K *n.v.*).

Beyeria preissii Sond., *Linnaea* 28: 564 (1857) *nom. superfl.* **Type:** [Western Australia.] *s.loc.* [*s.d.* in sandy hills on Rottnest Island, 19 August 1839], [*J.A.L.*] *Preiss 2387* (lecto (here chosen): MEL 2062918 ex Sonder Herb.; isolecto: LD 99/018-0879, MEL [2 sheets 2062937 ex Sonder Herb, 114267 ex Steetz Herb.], G-DC *n.v.* [microfiche IDC 800-73. 2454: III. 1], P 275782, U 19718).

Beyeria viscosa var. *genuina* Müll.Arg. in A.DC., *Prodr.* 15(2): 202 (1866), *nom. inval.* [ICBN, Art. 24.3].

***Illustrations*:** Cunningham *et al.* (1982: 453); Rippey & Rowland (1995: 107); Jeanes (1999: 67, fig. 10j).

Dioecious or rarely monoecious, dense rounded or slender **shrubs or rarely small trees** to 5 m high, usually resinous on young shoots, buds and adaxial surface of leaf. Main trunk with flaky, grey bark. Young branchlets of unknown colour in fresh state, angular becoming ± terete with age, densely hairy with minute appressed hairs (obscured by resinous covering); older branches with grey, ± smooth or shallowly fissured bark. **Leaves** petiolate; petioles 3–6 mm long, glabrous, 6 or 7 pairs of sessile glands on adaxial face; blades narrow-elliptic to elliptic, oblong elliptic, narrow-obovate to obovate, 20–90 mm long, 5–30 mm wide, length:width ratio 3–7:1; adaxial surface glabrous and smooth; abaxial surface hairy with stellate hairs *c.* 0.1 mm across, usually covered with resin; base obtuse to cuneate or attenuate; margins flat or slightly recurved; apex rounded, obtuse, acute or rarely retuse to emarginate; midvein impressed adaxially, abaxially prominently raised, rounded and glabrous; secondary and tertiary veins obscure or slightly impressed adaxially, obscure or visible abaxially; marginal glands absent. **Flowers** pedicellate, males axillary, solitary or in shortly pedunculate racemose clusters of up to 5 flowers, females axillary or terminal on short axillary branchlet, solitary or rarely in shortly pedunculate lax clusters of up to 3 flowers; peduncles up to 2–4 mm long, glabrous or if puberulous, then indumentum usually concealed by resinous covering; bracts oblong, 1–3 mm long, rounded at apex, glabrous; pedicels angular, puberulous, indumentum usually concealed by resinous covering, stouter on female flowers than on male flowers; calyx lobes 5(rarely 4 or 6), pale green, glabrous or puberulous and usually concealed by resinous covering; petals absent; disc obscure, absent or ± a continuous ring. **Male flowers** with pedicels 3–10 mm long; calyx lobes oblong, ovate, broad-ovate or suborbicular, 2.8–5.2 mm long, 2.6–4 mm wide, concavo-convex, the margins erose, obtuse to rounded at apex; receptacle *c.* 2 mm across, glabrous or hairy; stamens 30–70; filaments ± erect, 0.5–1.8 mm long, glabrous or rarely with scattered hairs proximally, entire; anthers 0.9–2 mm long. **Female flowers** with pedicels 5–20 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, oblong or suborbicular, 2.2–3 mm long, 1.5–2.3 mm wide, plano-convex, the margins entire, rounded to obtuse at apex; ovary subglobose, ± trigonal, 1–2.6 mm long, glabrous, thickly resinous, 3-locular; style obsolete, < 0.1 mm long; stigma calyptriform, 1.8–2 mm across, glabrous, with margins erose. **Fruits** globose, weakly to strongly trilobate, green or purple, 6–8 mm long, 6–8.5 (–10) mm across, 3-seeded, glabrous or rarely with scattered

stellate hairs, resinous, smooth; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 4.5–7.2 mm long (including caruncle), 2.6–4 mm across, 1.9–3.5 mm in thickness; testa light brown, brown to reddish brown, usually mottled; caruncle 1–2 mm long, 1.5–2 mm wide, yellowish-white.

***Additional selected specimens examined*: Western Australia.** near S end of Useless Harbour in Sharks Bay, 1863, *Brown s.n.* (MEL 114268); East Wallabi Island [Houtman Abrolhos], Jul 1970, *Ashby 3263* (PERTH); Garden Island, Sep 1978, *Marchant s.n.* (PERTH 06845983); near upper carpark, Bunker Bay, Cape Naturaliste, WNW of Busselton, Sep 1988, *Henderson H3200* (BRI); SE peninsula, Middle Island, Recherche Archipelago, Nov 1973, *Weston 8791 & Trudgen* (CANB, PERTH). **South Australia.** Boston Point, Eyre Peninsula, [in 1851?,] *Wilhelm s.n.* (MEL 2065872). **Queensland.** North Kennedy District. Sally's Mesa, 34 km from Greenvale on Charters Towers road, Feb 1994, *Forster PIF14975 & Bean* (BRI). Mitchell District. 41 km NW of Torrens Creek, Apr 1993, *Thompson HUG410 et al.* (BRI). Leichhardt District. Little St Peter, 10 miles [*c.* 16 km] N of Springsure, Sep 1985, *O'Keeffe 781* (BRI, CANB). Darling Downs District. Dunmore S.F., 49.3 km WSW of Dalby, Apr 1995, *Halford Q2488* (BRI). **New South Wales.** MacIntyre Falls, 35.2 km NW of Ashford on the Wallangarra road, Mar 1987, *Coveny 12517 et al.* (BRI, NSW); *c.* 6 km N of Cobar on road to Bourke, Oct 1989, *Henderson & Turpin H3367* (BRI, NSW); Mt Wombelong, Warrumbungle Ranges, Dec 1973, *Streimann HS550* (AD, BRI, CANB); Bungonia Gorge, S of Marulan, Nov 1966, *Pullen 4166* (BRI, MEL, NSW); The Rock NR, 30 km SW of Wagga Wagga, Nov 1975, *Crisp 1835* (AD, BRI, NSW); Erskine Creek, Nepean River, Sep 1888, *Maiden s.n.* (NSW 463865). **Victoria.** Sorrento, Nov 1903, *Weindorfer s.n.* (MEL 114270). **Tasmania.** 10 miles [*c.* 16 km] from Launceston, Jan 1949, *Burbidge 2941* (CANB, HO); St Pauls River E of Cutoff Hill, May 1985, *Collier 519* (HO); Longley, beside North West Bay River, Jan 1989, *Davies 782 & Ollerenshaw* (BRI, MEL); above old quarry on Mystery Caves track, Jan 1983, *Forbes 1334* (CANB, HO, MEL).

***Distribution and habitat*:** *Beyeria viscosa* has a disjunct distribution occurring in western and eastern Australia (**Map 7**). In south-western Western Australia it occurs in scattered populations in coastal areas from Shark Bay south to Yallingup and on the south coast in the Archipelago of the Recherche near Esperance. It grows in heathland and shrubland communities in sandy soils over limestone or rarely on sandy clay soils over granite. There is a single record (*George 14178* (PERTH)) from a slope near a creek in Jarrah/Marri forest on sandy loam over laterite.

In eastern Australia it occurs in subcoastal and inland areas from Ingham, north-eastern Queensland south to the southern coast of New South Wales, Flinders Island, eastern Tasmania, and single collections from Boston Point, Eyre Peninsula, South Australia, and Sorrento, Victoria. In inland areas it grows mostly in mallee or *Eucalyptus* woodland communities, in skeletal sandy loams or red earths, in gullies, on ridges, rocky slopes and hilltops. In subcoastal areas it grows in mostly *Eucalyptus* dominated open forests in gullies, along river banks and on gentle slopes.

***Phenology*:** Flowers have been recorded throughout the year, particularly from June to January, fruits in August to November.

***Typification*:** In the protologue of *Croton viscosus*, Labillardière (1806) did not cite any particular collection but made the statement "Habitat in terra Van-Leuwin". The location cited in the protologue refers to the area around the present town of Esperance and Esperance Bay, Western Australia (Nelson 1974, 1975). Labillardière made botanical collections in this area in 1792 as well as in Tasmania while a member of D'Entrecasteaux's expedition. Labillardière's Herbarium now resides in Florence (FI-WEBB). On our behalf Alex Chapman, while Australian Botanical Liaison Officer at K, visited FI and searched for relevant type material. We have seen photographs of two specimens from Labillardière's Herbarium, namely sheets stamped with Herbarium Webbianum numbers 165908 and 165910. The sheet numbered 165908 has pinned to it a printed label "Herbarium Webbianum, ex Herb. Labillardière" with the hand written annotation 'Nova Hollandia, ora austro-occidentalis', two pages with a handwritten draft of the description that appeared in the protologue of *Croton viscosus* and three small slips of paper with handwritten notes mostly of which are indecipherable. The four specimens that are attached to the sheet all appear to be part of a single collection, although three bear female flowers or fruit and the other bears male flowers. The sheet numbered 165910 has a printed label "Herbarium Webbianum, ex Herb. Labillardière" with the annotation 'Nova Hollandia et terra Dieman' and three small slips of paper with handwritten notes that

are mostly indecipherable. The four specimens that are attached to the sheet appear to be from two separate collections. The sheet numbered 165908 is here selected a lectotype for the name *Croton viscosus* as it is part of the original material and has morphology that agrees with the description in the protologue.

Müller (1866) cited two collections in his protologue of *Beyeria viscosa* var. *amoena* namely "In Nova Hollandia in monte Flinders (hb. Hook!)" and "in Australia Felice (Ferd. Muell.! in hb. DC.)". The collection in the Hooker herbarium has not been located in material on loan from Kew of this genus. The collection in G-DC is selected here as lectotype of this name.

***Affinities*:** *Beyeria viscosa* is morphologically similar to *B. lanceolata* and *B. lasiocarpa*. It differs from *B. lanceolata* in having narrow-elliptic to obovate rather than lanceolate leaf blades and smaller globose fruit (6–8 mm long compared with 10–12 mm long). *Beyeria viscosa* differs from *B. lasiocarpa* by having glabrous (rather than densely hairy) ovaries and fruits and a resinous abaxial surface of its leaf blades.

***Notes*:** The combination *Beyeria oblongifolia* was also made by J.D.Hooker in December 1857, four months after Sonder's.

In his protologue of *Beyeria viscosa*, Miquel listed "*Croton viscosum* Labillard..?". This doubtful inclusion of Labillardière's name has led many authors to presume that Miquel had made a new combination and therefore ascribe the authorship of the name *B. viscosa* as (Labill.) Miq. However, Miquel made the statement in the protologue of *B. viscosa* that no specimen of *Croton viscosus* Labill. was available to him and it had not been possible to confirm that *Croton viscosus* Labill. was the same as his species. We contend that this clearly indicates that Miquel was not transferring Labillardière's name but publishing a new name for which Miquel should be attributed the sole authorship.

This species as circumscribed here varies considerably in the shape, length and width of its leaf blades. This variation has led several authors in the past to describe a number of infraspecific and specific taxa (Müller 1866; Bentham 1873; White 1939). Much more material has since been collected and although the extreme forms within this species differ considerably, much of the morphological variation appears to intergrade especially with the variants in eastern Australia, making it difficult to assign material unequivocally to one or other of them. For this reason we have not formally recognised any variants here. However, the more notable variants are discussed below.

In Western Australia, specimens typically have large (30–70 mm long, 10–30 m wide) leaves that are narrow-elliptic to elliptic or rarely narrow-obovate and 2.2 to 3.5 times as long as wide, obtuse to cuneate leaf bases, rounded to obtuse leaf apices, secondary and tertiary veins visible on abaxial surface of leaves, and a glabrous receptacle in male flowers. This variant includes the type of the name *Beyeria viscosa* Miq.

In Tasmania and Victoria, specimens have leaves that are generally narrower and more attenuate (40–90 mm long, 8–18 mm wide) and 3–5 times as long as wide, cuneate leaf bases, obtuse to acute leaf apices, secondary and tertiary veins obscure or faintly visible on abaxial surface of leaves, and a glabrous or sparsely hairy receptacle in male flowers.

In southern Queensland and New South Wales, specimens have typically smaller (20–50 mm long, 4–10 mm wide) leaves that are narrow-obovate and 3 to 6 times as long as wide, cuneate leaf bases, rounded to obtuse or rarely retuse leaf apices, secondary and tertiary veins obscure on abaxial leaf surface of leaves and densely hairy receptacle in male flowers. In the more mesic habitats in Central and South Coast, and Southern Tablelands of New South Wales, the leaves of this variant are generally broader and longer (50–70 mm long, 15–20 mm wide) than populations in drier habitats.

In northern Queensland, specimens have typically smaller (20–55 mm long, 10–30 mm wide) narrow-obovate to obovate leaves that 1.8 to 3 times as long as wide, cuneate to attenuate leaf bases, rounded to retuse or emarginate leaf apices, secondary and tertiary veins obscure on abaxial surface of leaves and a densely hairy receptacle in male flowers.

Beyeria sect. **Beyeriopsis** (Müll.Arg.) Benth., Fl. Austral. 6: 63, 66 (1873); *Beyeriopsis* Müll. Arg., *Linnaea* 34: 56 (1865). **Type:** *B. brevifolia* (Müll.Arg.) Benth.

Shrubs. **Flowers** petalous, slightly shorter than or equal to calyx lobes. **Male flowers** calyx lobes ± erect enclosing or appressed to androecium at anthesis; receptacle flat to convex; filaments entire or bifid distally; anthers of two separate, obloid, parallel but contiguous cells, each transverse on the apex of the filament; connective extending beyond anther cells. **Female flowers** with stigmas calyptriform, discoid or shallowly 3-lobulate.

***Distribution*:** The species of *Beyeria* sect. *Beyeriopsis* are confined to south-western Western Australia.

Key to species of *Beyeria* sect. *Beyeriopsis*

1 Young branchlets hairy 2
1. Young branchlets glabrous 9

2 Young branchlets densely hairy between glabrous longitudinal ridges; calyx lobes prominently keeled abaxially . . . . . **12. B. constellata**
2. Young branchlets evenly covered with a sparse to dense indumentum; calyx lobes rounded abaxially 3

3 Leaf blades > 5 mm wide . . . . . **16. B. latifolia**
3. Leaf blades ≤ 5 mm wide 4

4 Young branchlets with a sparse to moderately dense indumentum of stellate hairs; rays of hairs spreading to ascending 5
4. Young branchlets with a sparse to dense indumentum of simple or bifid hairs; hairs ascending to erect 6

5 Pedicels ≤ 7 mm long . . . . . **10. B. cinerea**
5. Pedicels > 7 mm long . . . . . **17. B. lepidopetala**

6 Pedicels ≥ 5 mm long . . . . . **8. B. brevifolia**
6. Pedicels < 5 mm long 7

7 Young branchlets resinous, sparsely hairy; hairs < 0.3 mm long; ovaries 3-locular . . . . . **11. B. cockertonii**
7. Young branchlets non-resinous, moderately to densely hairy; hairs ≥ 0.3; ovaries 2-locular 8

8 Flowers pedicellate; pedicels 2–4 mm long; ovaries glabrous . . . . . **22. B. simplex**
8. Flowers ± sessile; ovaries densely hairy . . . . . **24. B. villosa**

9 Young branchlets longitudinally grooved 10
9. Young branchlets not longitudinally grooved 15

10 Fruiting calyces 4–7 mm long . . . . . **9. B. calycina**
10. Fruiting calyces < 4 mm long 11

11 Leaf apices rounded or obtuse, without excurrent midrib 12
11. Leaf apices rounded, obtuse, acute to attenuate or truncate, ultimately terminated with excurrent midrib 13

12 Leaf blades < 6 mm long . . . . . **19. B. physaphylla**
12. Leaf blades > 6 mm long . . . . . **20. B. rostellata**

13 Pedicels hairy proximally with minute erect glandular hairs *c.* 0.05 mm long . . . . . **13. B. disciformis**
13. Pedicels glabrous 14

14 Calyx lobes of female flowers suborbicular to very broad-ovate, *c.* 2.5 mm long; fruiting calyces *c.* half of fruit length . . . . . **18. B. minor**
14. Calyx lobes of female flowers broad-oblong or broad-obovate, 0.8–1.3 mm long; fruiting calyces < one third of fruit length . . . . . **23. B. sulcata**

15 Leaf apices acute to obtuse, ultimately apiculate with extension from midrib 16
15. Leaf apices obtuse to rounded, without excurrent midrib 18

16 Branchlets and leaves non-resinous; leaf apices with slender apiculum, 0.3–0.6 mm long . . . . . **7. B. apiculata**
16. Branchlets and leaves mostly thickly resinous; leaf apices with stout apiculum, up to 0.2 mm long 17

17 Leaf blades 1.4–2 mm wide, length:width ratio < 10; leaf apices rounded . . . . . **15. B. lapidicola**
17. Leaf blades 0.9–1.5 mm wide, length:width ratio 10–20; leaf apices acute to attenuate . . . . . **23. B. sulcata**

18 Adaxial surface of leaf blades smooth, non-resinous . . . . . **8. B. brevifolia**
18. Adaxial surface of leaf blades papillose, tuberculate, usually resinous 19

19 Male flowers with pedicels 7–11 mm long; ovaries without horn-like appendages . . . . . **15. B. lapidicola**
19. Male flowers with pedicels 0.5–4 mm long; ovaries crowned by 4–6 horn-like appendages; 20

20 Leaf blades 5–16 mm long; pedicels of male flowers 1–2 mm long; pedicels of female flowers 1–3 mm long; subapical appendage on fruit up to 1 mm long . . . . . **14. B. gardneri**
20. Leaf blades 20–50 mm long; pedicels of male flowers 2–3 mm long; pedicels of female flowers 5–10 mm long; subapical appendage on fruit up to 2 mm long . . . . . **21. B. similis**

7. Beyeria apiculata Halford & R.J.F.Hend. **spcies nova** *B. brevifolia* (Müll.Arg.) Benth. maxime affinis sed foliis sessilibus vel breviter petiolatis petiolis usque ad 0.5 mm longis non petiolis 1–2 mm longis, folii lamina plerumque longiore, 10–40 mm longa non 5–15 mm longa, et apiculato ad apicem, flore mare staminibus 9–11 non *c.* 30 et flore femineo ovario 3-loculato non 2-loculato distinguenda est. **Typus:** Western Australia. O'Briens Lookout, *c.* 12 km NW of Wongan Hills, 14 September 1988, *R.J.F.Henderson H3157* (holo: BRI; iso: MEL, PERTH, MO, distribuendi).

Monoecious, spreading **shrubs** to 1.5 m high, not resinous. Young branchlets pale green and angular becoming reddish brown and terete with age, glabrous; older branchlets with grey to black shallowly fissured bark. **Leaves** sessile or shortly petiolate; petioles up to 0.5 mm long, glabrous; blades linear, 10–40 mm long, 1–1.3 mm wide, length: width ratio 10–30:1; adaxial surface glabrous and ± smooth; abaxial surface hairy with ± sessile, stellate hairs *c.* 0.1mm across, base cuneate; margins revolute to midrib concealing abaxial leaf surface; apex obtuse to acute, ultimately apiculate with extension from midrib; apiculum slender, 0.3–0.6 mm long, recurved; midvein obscure adaxially, abaxially raised, flattened and glabrous on abaxial face; secondary and tertiary veins obscure; marginal glands rarely present on

blade, up to 1 mm from blade base, 1 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, axillary, solitary or rarely 2 per axil; bracts ± triangular or narrow-oblong, 0.4–1.5 mm long, acute at apex, ± glabrous; pedicels ± glabrous except for scattered minute erect hairs, stouter and longer on female flowers than on male flowers; calyx lobes 5, green, suborbicular, glabrous, concave adaxially, gibbose abaxially, the margins erose, rounded at apex; petals slightly shorter than or equal to calyx lobes, erect, suborbicular or depressed obovate, glabrous abaxially, sparsely to moderately villose adaxially, the margins erose distally; disc obscure or absent. **Male flowers** with pedicels 2–4 mm long; calyx lobes 1–1.3 mm long, 1–1.1 mm wide, surrounding androecium at anthesis; petals 0.5–0.6 mm long, 0.5–0.6 mm wide; receptacle 0.8–1 mm across, minutely hairy; stamens 9–11; filaments erect, 0.1–0.3 mm long, glabrous, bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with pedicels 5–12 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 1–1.3 mm long, 0.8–1.1 mm wide; petals marcescent, 1–1.3 mm long, 0.8–1 mm wide; ovary ellipsoid, trilobate, 0.6–1 mm long, glabrous, 3-locular; style ± obsolete; stigma ± discoid, 0.4–0.5 mm across, glabrous, with margins entire. **Fruits** subellipsoid, 3–4 mm long, 3.4–4 mm across, 1–3-seeded, glabrous, smooth; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 3.5–3.7 mm long (including caruncle), 1.9–2.1 mm across, 1.4–1.6 mm in thickness; testa light to dark brown; caruncle 0.6–0.8 mm long, 0.8–1.3 mm wide, light brown. **Fig. 2.**

***Additional specimens examined*: Western Australia.** 6 miles [*c.* 10 km] from Three Springs, towards Arrino, Sep 1968, *Phillips WA/68 955* (CANB); TV Translator Hill, 13.5 km NE of township of Wongan Hills on Piawaning road, Oct 1984, *Kenneally 9344* (CANB, PERTH); E edge of the Wongan Hills, *c.* 15 km N of the township of Wongan Hills, Aug 1980, *Kenneally 7409* (PERTH).

***Distribution and habitat*:** *Beyeria apiculata* occurs in south-western Western Australia where it is known from near Wongan Hills and Three Springs (**Map 8**). It is recorded as growing in a *Casuarina/Eucalyptus* woodland community on shallow stony red loamy soil on a lateritic rise.

***Phenology*:** Flowers have been collected from August to October, fruits in August and September.

***Affinities*:** *B. apiculata* is morphologically most similar to *B. brevifolia* (Müll.Arg.) Benth. but can be distinguished by its more or less sessile to shortly petiolate leaves (petioles up to 0.5 mm long compared with petioles 1–2 mm long), generally longer leaf blades (10–40 mm long compared with 5–15 mm long), its apiculate leaf apex (rather than obtuse to rounded in *B. brevifolia*), fewer number of stamens per male flower (9–11 compared with *c.* 30) and its female flowers with a 3-locular rather than a 2-locular ovary.

***Etymology*:** The specific epithet is from Latin *apiculatus*, ending abruptly in a short point, and refers to the apiculate apex of the leaf blades of this species.

8. Beyeria brevifolia (Müll.Arg.) Benth., *Fl. Austral.* 6: 67–68 (1873); *Beyeriopsis brevifolia* Müll.Arg., *Linnaea* 34: 58 (1865); *Beyeria brevifolia* (Müll.Arg.) Benth. var. *brevifolia*, Airy Shaw, *Kew Bull.* 26: 69 (1971). **Type:** [Western Australia.] Swan River, *s.d.*, [*J.*] *Drummond ser. 4. n. 215* [holo: G-DC *n.v.* (microfiche IDC 800-73. 2454: II. 5]; iso: K, PERTH).

Monoecious, erect, virgate **shrubs** to 1.8 m high, not resinous. Young branchlets reddish brown, ± angular, glabrous or rarely sparsely to moderately hairy and glabrescent; hairs simple, erect to ascending, *c.* 0.1 mm long; older branchlets terete, with grey shallowly fissured bark. **Leaves** petiolate; petioles 1–2 mm long, glabrous; blades narrow-oblong to linear, 5–15 mm long, 0.8–1.6 mm wide, length:width ratio 6–12:1; adaxial surface glabrous and ± smooth; abaxial surface hairy with ± sessile, stellate hairs < 0.1 mm across; base cuneate; margins recurved or revolute to midrib concealing abaxial leaf surface; apex obtuse to rounded, straight or slightly recurved; midvein obscure adaxially, abaxially raised, flattened and glabrous on abaxial face; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary or terminal on short

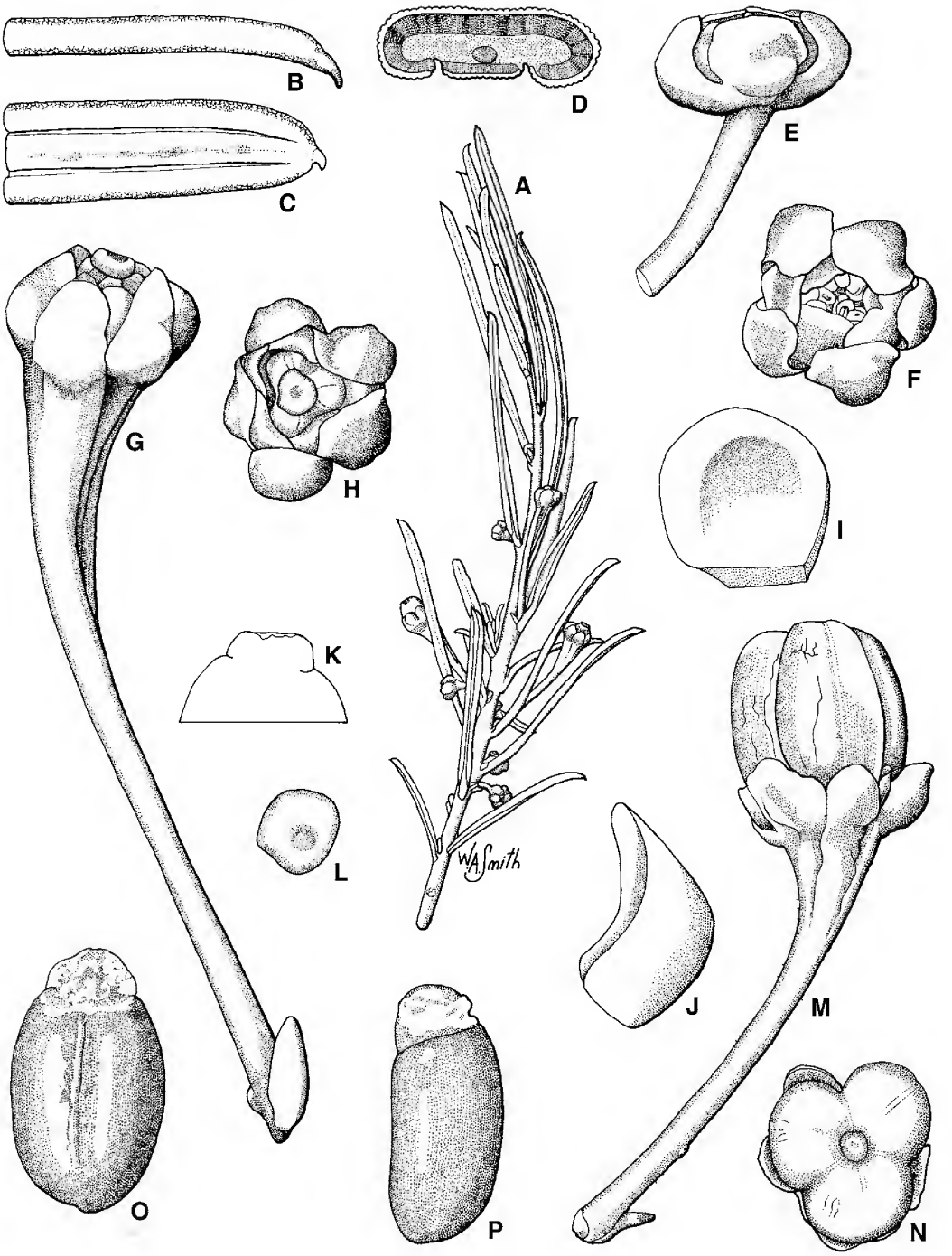

Fig. 2. ***Beyeria apiculata***. A. branchlet with male and female flowers × 2. B. side view of leaf apex × 12. C. abaxial view of leaf apex × 12. D. transverse section of leaf × 24. E. side view of male flower × 15. F. face view of male flower × 15. G. side view of female flower × 12. H. face view of female flower × 12. I. adaxial view of calyx lobe from female flower × 24. J. side view of calyx lobe from female flower × 24. K. transverse section of stigma and distal half of ovary × 24. L. face view of stigma × 24. M. side view of fruit × 8. N. face view of fruit × 8. O. abaxial view of seed × 10. P. side view of seed × 10. A–P from *Henderson H3157* (BRI). Del. W.Smith.

axillary branchlets, solitary; bracts ± triangular, up to 0.4 mm long, acute at apex, ± glabrous; pedicels ± glabrous, slightly stouter on female flowers than on male flowers; calyx lobes 5, yellowish green, suborbicular to very broad-ovate, glabrous, concavo-convex, the margins erose, rounded to broad-obtuse at apex; petals slightly shorter than calyx lobes, erect, depressed obovate, glabrous abaxially, sparsely to moderately villose adaxially distally, the margins erose distally; disc of 5 discrete glands; glands fleshy, glabrous. **Male flowers** with pedicels 5–15 mm long; calyx lobes 0.8–1 mm long, 0.9–1.1 mm wide, surrounding androecium at anthesis; petals 0.6–0.9 mm long, 0.5–1.4 mm wide; disc glands *c.* 0.3 mm long, ±truncate or lobed distally, canaliculate adaxially; receptacle 1–1.3 mm across, glabrous; stamens 30; filaments erect, 0.1–0.3 mm long, glabrous, bifid distally; anthers *c.* 0.3 mm long. **Female flowers** with pedicels 7–13 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 0.9–1.3 mm long, 0.8–1 mm wide; petals marcescent, 0.6–1 mm long, 0.6–1 mm wide; disc glands 0.4–0.6 mm long, concavo-convex, rounded, truncate or shallowly lobed at apex; ovary ellipsoid, 0.9–1.3 mm long, glabrous, 2-locular; style *c.* 0.1 mm long, glabrous; stigma calyptriform, 0.9–1.4 mm across, shallowly umbilicate, glabrous, with margins entire. **Fruits** broad-ovoid or obliquely ellipsoid, laterally compressed, 5–6.7 mm long, 3.4–6 mm across, 1- or 2-seeded, glabrous, smooth; persistent calyx *c.* one fifth the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 5.2 mm long (including caruncle), 3.2 mm across and 2.7 mm in thickness; testa light to dark brown, shiny; caruncle *c.* 1.7 mm long and 2 mm wide, yellowish-brown.

***Additional selected specimens examined*: Western Australia.** 5 km N of Nyabing, Sep 1979, *Crisp 6145 et al.* (BRI); NW slopes of Mt Short, *c.* 14 km NW of Ravensthorpe, Sep 1988, *Henderson H3188* (BRI); near NW base of Mt Short, *c.* 14 km NW of Ravensthorpe, Sep 1988, *Henderson H3189* (BRI); Mt Short, Sep 1968, *Wilson 7980* (PERTH); Ravensthorpe Shire, Hamersley Inlet Reserve, track to mouth of Hamersley Inlet, *c.* 500 m S of turnoff to CALM campsite, Aug 2001, *Hislop 2286* (BRI, PERTH); Mt Desmond, Aug 1964, *Gardner 14074* (PERTH); E side of Mt Desmond, Apr 1962, *George 3661* (PERTH); SW side of Mt Desmond, *c.* 10 km ESE of Ravensthorpe, Sep 1988, *Henderson H3191* (BRI); 11 km ESE of Ravensthorpe, Oct 1966, *Muir 4217* (MEL); 8 km S of Ravensthorpe on road to Hopetoun, Aug 1968, *Wilson 7075* (PERTH); Mt Short, 10 miles [*c.* 16 km] N of Ravensthorpe, Nov 1968, *Wrigley s.n.* (CANB [CBG036514], PERTH); 77.5 miles [*c.* 124.7 km] N of Albany on Jerramungup road, Jan 1975, *Keighery 357* (PERTH); 2 miles [*c.* 3.2 km] from coast, E of Fitzgerald Inlet, Sep 1970, *Aplin 3706* (BRI, PERTH); Fitzgerald River, May 1964, *Gardner 14765* (PERTH); Mt Maxwell (Fitzgerald River N.P.), Sep 1985, *Newbey 10966* (BRI, PERTH).

***Distribution and habitat*:** *Beyeria brevifolia* occurs in south-western Western Australia where it is known from near Jerramungup, north-eastwards to Mt Desmond near Ravensthorpe, with disjunct populations near Harrismith and Nyabing (**Map 9**). It grows in mallee communities with heath understorey, on gravelly, sandy loam or stony clay soils on hillsides and undulating sandy plains.

***Phenology*:** Flowers have been collected in January, April, May and from August to November, fruits from August to October.

***Affinities*:** *Beyeria brevifolia* is morphologically most similar to *B. apiculata*. For features distinguishing *B. brevifolia* from *B. apiculata*, refer to the 'Affinities' section under that species.

***Notes*:** The collections from the disjunct populations at Harrismith and Nyabing (*Frizell & Morrison* (PERTH) from Harrismith and *Crisp 6145 et al.* (BRI) from Nyabing) differ from the other collections of this species examined by having a sparse to moderately dense indumentum of simple hairs on the young branchlets. Further collections and field studies are warranted to establish the significance of this difference.

9. Beyeria calycina Airy Shaw, *Kew Bull.* 26: 70 (1971); *Beyeria calycina* Airy Shaw var. *calycina*, Airy Shaw, *Kew Bull.* 26: 70 (1971). **Type:** Western Australia. Coolgardie District: 17 miles [*c.* 27 km] W of Lake King turnoff from Coolgardie – Esperance road, near granite outcrop, October 1963, *P.R.Jefferies 631018* (holo: PERTH; iso: PERTH, K).

Monoecious, spreading, much-branched **shrubs** to 1 (–1.5) m high, resinous on most parts. Young branchlets yellowish green, ± angular, longitudinally grooved, glabrous, thickly resinous; older branchlets terete, with

grey to black shallowly fissured bark. **Leaves** petiolate; petioles 0.8–2 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades linear, 15–35 mm long, 2–3 mm wide, length:width ratio 7–12:1; adaxial surface ± glabrous, minutely papillose (obscured by thick resinous covering); abaxial surface densely hairy with ± sessile, stellate hairs *c.* 1 mm across; base cuneate or attenuate; margins recurved to midrib concealing abaxial leaf surface; apex obtuse to acute, ultimately apiculate with extension from midrib; apiculum stout, *c.* 0.3 mm long, bent upward; midvein slightly impressed adaxially, abaxially raised, flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands present on blade, ± regularly spaced from base to apex of blade, up to 12 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, axillary, solitary; bracts ± ovate, 3–4 mm long, obtuse at apex, glabrous abaxially, stellate hairy adaxially; pedicels ± glabrous except for scattered minute erect hairs proximally, stouter on female flowers than on male flowers; calyx lobes 5, green, glabrous, rounded to obtuse at apex; petals ± equal in length to calyx lobes, erect, obovate, sparsely to moderately villose on both surfaces proximally, the margins erose distally; disc of 5 discrete glands; glands fleshy, *c.* 0.3 mm long, glabrous, dorsi-ventrally compressed. **Male flowers** with pedicels 3–4 mm long; calyx lobes suborbicular or very broad-ovate, 1.2–1.5 mm long, 1.5–2.5 mm wide, surrounding androecium at anthesis; petals *c.* 1.5 mm long and 1 mm wide; receptacle *c.* 1 mm across, minutely hairy; stamens 15–20; filaments erect, 0.2–0.6 mm long, glabrous, entire; anthers *c.* 0.5 mm long. **Female flowers** with pedicels *c.* 5 mm long; calyx lobes accrescent, appressed to and enclosing gynoecium apart from stigma, broad-obovate, 2–3.5 mm long (up to 7 mm long in fruit), 2.5–3 mm wide; petals marcescent, 2–2.5 mm long, 1.5–2 mm wide; ovary ellipsoid, trilobate, *c.* 1.5 mm long, glabrous, minutely papillose, 3-locular; style 0.6–1 mm long, glabrous; stigma discoid, *c.* 0.3 mm across, the same width as style, glabrous, with margins entire. **Fruits** broad-ellipsoid, *c.* 4.5 mm long, 4–4.5 mm across, 1–3-seeded, glabrous, minutely papillose; persistent calyx longer than length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 3.5–4.2 mm long (including caruncle), 2–2.5 mm across, 1.5–1.8 mm in thickness; testa light to dark brown; caruncle 0.5–0.9 mm long, 1–1.4 mm wide, creamy-white.

***Additional selected specimens examined*: Western Australia.** *c.* 27 km SW of Daniell, between Norseman and Salmon Gums, on road to Lake King, Sep 1988, *Henderson H3177* (BRI); 21 km W of Norseman – Esperance road, along Frank Hann road, Nov 1994, *Cranfield 9389* (BRI, PERTH); 14 miles [*c.* 22 km] W of junction of Norseman – Esperance and Lake King roads, May 1964, *Jefferies 640511* (PERTH); [without locality,] Oct 1961, *D.E. White s.n.* (PERTH).

***Distribution and habitat*:** *Beyeria calycina* occurs in south-western Western Australia where it is known from between Norseman and Salmon Gums (**Map 10**). It grows in *Casuarina* shrubland with scattered mallee eucalypts and a shrubby layer on red brown sandy loam on undulating plains.

***Phenology*:** Flowers have been collected in September and October, fruits in October.

***Affinities*:** *Beyeria calycina*, *B. disciformis* Halford & R.J.F.Hend. and *B. minor* (Airy Shaw) Halford & R.J.F.Hend. are the only *Beyeria* species that have accrescent calyces. For features distinguishing *B. calycina* from those species, refer to the 'Affinities' section under the species concerned.

10. Beyeria cinerea (Müll.Arg.) Benth., *Fl. Austral.* 6: 66 (1873); *Beyeriopsis cinerea* Müll.Arg., *Linnaea* 34: 57 (1865). **Type:** [Western Australia.] in western New Holland at Swan River, *s.d.*, [*J.*] *Drummond 724* (holo: G-DC *n.v.* [microfiche IDC 800-73. 2454: II. 2]; iso: W *n.v.* [photo at BRI], K).

Dioecious or sometimes monoecious, open, spreading, erect or prostrate **shrubs** to 0.7 m high, not resinous. Young branchlets of unknown colour when fresh, terete, sparsely to moderately hairy, glabrescent with age; hairs stellate, stipitate, up to 0.8 mm across; older branchlets with greyish white, shallowly fissured bark. **Leaves** petiolate; petioles 0.5–2.7 mm long, moderately hairy with indumentum as for branchlets; blades narrow-ovate to broad-ovate, narrow-elliptic or triangular, 3–17 mm long, 1.2–5 mm wide,

length:width ratio 2–4:1; adaxial surface sparsely hairy with stipitate stellate hairs *c.* 0.7 mm across, becoming glabrous with age though remaining sparsely tuberculate by persistent hair bases; abaxial surface densely hairy with sessile and stipitate stellate hairs up to 0.4 mm across; base cordate, cuneate to truncate; margin recurved or revolute sometimes to midrib concealing abaxial leaf surface; apex obtuse or acute; midvein obscure or faintly impressed adaxially, abaxially raised, moderately hairy with stellate hairs; secondary and tertiary venation obscure; marginal glands absent. **Flowers** pedicellate, axillary, males fasciculate in 2- or 3-flowered fascicles or solitary, females solitary; bracts ovate or oblong, 0.4–0.6 mm long, obtuse at tip, glabrous or with a few stellate hairs; pedicels slender, 1–3.5 (–7) mm long, glabrous or with a few stellate hairs; calyx lobes 5, yellow green to light green, concave and glabrous adaxially, gibbose with a few stipitate stellate hairs abaxially, the margins erose, obtuse to rounded at apex; petals slightly shorter than or equal to calyx lobes, erect, the margins erose; disc of 5 discrete glands; glands fleshy, 0.2–0.3 mm long, laterally compressed, glabrous, truncate to rounded or irregularly lobed. **Male flowers** with calyx lobes suborbicular to depressed ovate, 1–1.3 mm long, 1–1.6 mm wide, surrounding androecium at anthesis; petals suborbicular or depressed obovate, 0.5–0.8 mm long, 0.7–1 mm wide, glabrous abaxially, with scattered stellate hairs adaxially proximally; receptacle *c.* 1 mm across, stellate-tomentose; stamens 20–40; filaments erect, 0.2–0.5 mm long, glabrous, bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with calyx lobes ± appressed to and enclosing gynoecium apart from stigma, suborbicular or broad-ovate, 0.7–1.1 mm long, 0.7–0.8 mm wide; petals suborbicular or transverse-elliptic, 0.3–0.6 mm long, 0.3–0.9 mm wide, glabrous abaxially, stellate-tomentose adaxially distally; ovary subglobose, 0.5–0.7 mm long, stellate-pubescent or glabrous, mostly 1-locular by abortion, rarely 2-locular; style *c.* 0.2 mm long, stellate-pubescent; stigma ± discoid, 0.4–0.5 mm wide, glabrous, sulcate adaxially, with margins entire, slightly recurved. **Fruits** obliquely or transverse-pyriform, 4–6 mm long, 2.5–3.8 mm across, 1- or rarely 2-seeded, glabrous or with scattered stellate hairs; persistent calyx *c.* one fifth the length of mature fruit. **Seeds** globose or broad-ellipsoid, slightly dorsi-ventrally compressed, 2.9–4.5 mm long (including caruncle), 2–2.7 mm wide, 2–2.5 mm in thickness; testa mottled cream and dark brown; caruncle 0.7–1.7 mm long, 0.8–1.5 mm across, creamy-white to yellowish-white.

***Affinities*:** *Beyeria cinerea* is morphologically most similar to *B. lepidopetala* F.Muell. but differs from that in having generally smaller leaves (3–17 mm long × 1.2–5 mm wide compared with 15–20 mm long × 1.5–3 mm wide) that are narrow-ovate to broad-ovate, narrow-elliptic or triangular rather than linear in outline and shorter pedicels (1–7 mm long compared with 8–30 mm long). *Beyeria cinerea* is also similar to *B. latifolia* Baill. but differs from it in having generally smaller leaves (3–17 mm long × 1.2–5 mm wide compared with 10–30 mm long × 6–12 mm wide) and smaller fruits (4–6 mm long × 2.5–3.8 mm across compared with 6–6.5 mm long × 4–5.5 mm across) that are more or less pyriform and 1-seeded rather than ovoid and 1–3-seeded.

Beyeria cinerea, as circumscribed here, occurs on the islands and in coastal areas from Exmouth to Mandurah, Western Australia. The species exhibits some discontinuous variation in leaf blade shape associated with a geographical disjunction. These differences are considered to be sufficient to warrant formal recognition of taxa at subspecific rank. Two subspecies are here formally described and they can be distinguished using the following key.

Leaf blades with truncate to cuneate bases . . . . . **10a. B. cinerea** subsp. **cinerea**

Leaf blades with cordate bases . . . . . **10b. B. cinerea** subsp. **borealis**

10a. Beyeria cinerea (Müll.Arg.) Benth. subsp. **cinerea**

Beyeriopsis cygnorum Müll.Arg., *Linnaea* 34: 56–57 (1865); *Beyeria cygnorum* (Müll. Arg.) Benth., *Fl. Austral.* 6: 66 (1873). **Type:** [Western Australia.] Swan River, *s.d.*, [*J.*] *Drummond 85* (holo: G-DC *n.v.* (microfiche IDC 800-73. 2454: I. 8); iso: MEL [2 sheets 114150, 114151], PERTH, K *n.v.* (photo at BRI)).

Leaves with petioles 1–2 mm long; leaf blades narrow-ovate to ovate or narrow-elliptic, 3.5–17 mm long, 1.2–5 mm wide; base cuneate to truncate; margins recurved or revolute; apex obtuse to acute.

***Additional selected specimens examined*: Western Australia.** Horrocks Beach, Aug 1984, *Bates 3919* (AD); 15.8 km N of Leeman – Eneabba road, turnoff on Illawong road, Jul 1992, *Cranfield & Spencer 8260* (PERTH); Beehive Gully, Leeman, 1982, *Foulds 33* (PERTH); 3 miles [*c.* 5 km] E of Jurien Bay, Sep 1966, *George 7810* (PERTH); Parrot Ridge, Yanchep N.P., 50 km N of Perth, Sep 1989, *Keighery 11165* (CANB); Reabold Hill, Floreat Park, 8 km W [of] Perth, Nov 1987, *Keighery 9262* (PERTH); Buckland Hill, Mosman Park, Sept 1989, *Kenneally 11007* (PERTH); The Plains, Mandurah road, Oct 1967, *George 9202* (PERTH); Madora, Perth to Mandurah, Sep 1983, *Keighery s.n.* (PERTH).

***Distribution and habitat*:** *Beyeria cinerea* subsp. *cinerea* occurs in south-western Western Australia where it is known from Horrocks Beach, south of Dongara, southward to near Mandurah (**Map 11**). It grows in coastal heath and shrubland communities on sandy soils over limestone.

***Phenology*:** Flowers have been collected in July and from September to November, fruits from September to November.

***Notes*:** The name *Beyeria cygnorum* which is here placed in synonymy is listed as Priority Three under DEC Conservation Codes for Western Australian Flora (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

10b. Beyeria cinerea subsp. **borealis** Halford & R.J.F.Hend. **subspecies nova** a *Beyeria cinerea* (Müll.Arg.) Benth. subsp. *cinerea* folii lamina generatim minore, 3–5.2 mm longa × 1.2–4.3 mm lata non 3.5–17 mm longa × 1.2–5 mm lata, basi laminae folii cordata non truncata ad cuneata et marginibus folii laminae folii revolutioribus differt. **Typus:** Western Australia. N end of Passage Paddock, Dirk Hartog Island, 2 September 1972, *A.S.George 11384* (holo: PERTH; iso: BRI, CANB).

Beyeriopsis cyanescens Müll.Arg. in A.DC., *Prodr.* 15(2): 200 (1866); *Beyeria cyanescens* (Müll.Arg.) Benth., *Fl. Austral.* 6: 66–67 (1873). **Type citation: "**In Nova Hollandia, in Iles-Steriles (hb. Kunth! in hb. berol. ex Mus. Paris)." *n.v.*

***Illustration*:** Grüning (1913: 74, fig. 12) as *Beyeria cyanescens*.

Leaves with petioles 0.5–2.5 mm long; blades triangular or narrow- to broad-ovate, 3–5.2 mm long, 1.2–4.3 mm wide; base cordate; margins revolute to midrib usually concealing abaxial surface of leaf blade; apex obtuse.

***Additional selected specimens examined*: Western Australia.** E of Pitgrammunne Well on Yardie Creek Station, Cape Range, Sep 1964, *Chadwick 1434* (PERTH); ± 5 miles [*c.* 8 km] N of Yardie Creek, May 1965, *George s.n.* (PERTH); Learmonth road, 44 miles [*c.* 71 km] S of Bullara turnoff, Feb 1962, *George 3284* (PERTH); 5 miles [*c.* 8 km] N of Cardabia Station turnoff, Minilya – Exmouth road, Sep 1970, *George 10349* (PERTH); Bernier Island, Shark Bay, Jul 1988, *Morat 8104* (PERTH); Blow Hole, Carnarvon, Aug 1976, *Wittwer W1797* (PERTH); Dorre Island, Jul 1959, *Royce 5897, 5896* (PERTH); *ibid*, Aug 1977, *Weston 10566* (PERTH); Quoin Bluff area, Shark Bay, Jun 1974, *Kenneally 1345* (PERTH); Red Bluff, *c.* 3 km S of Kalbarri, May 1968, *Wilson 6507* (PERTH).

***Distribution and habitat*:** *Beyeria cinerea* subsp. *borealis* is confined to coastal areas from Exmouth southwards to Kalbarri in Western Australia (**Map 12**). It grows in low scrub communities on red sandy soils on limestone rises.

***Phenology*:** Flowers have been collected in February and from June to September, fruits in May, July and September.

***Affinities*:** *Beyeria cinerea* subsp. *borealis* differs from *B. cinerea* subsp. *cinerea* by its generally smaller leaf blades (3–5.2 mm long × 1.2–4.3 mm wide compared with 3.5–17 mm long × 1.2–5 mm wide) which are cordate rather than truncate to cuneate at the base, and its more strongly revolute leaf blade margins.

***Etymology*:** The subspecific epithet is from Latin, *borealis*, northern, in reference to this subspecies' distribution in relation to that of the other subspecies.

11. Beyeria cockertonii Halford & R.J.F.Hend., **species nova** *B. brevifoliae* (Müll.Arg.) Benth. maxime affinis sed strato viscido tenui in partibus maximis, habitu breviore (usque ad 0.25 m alto non usque ad 1.8 m alto), pedicellis brevioribus (1–3 mm longis non 5–15 mm longis) et flore femineo stigmate 3-lobulato non calyptriformi et ovario 3-loculato non 2-loculato distinguenda est. **Typus:** Western Australia. SE of Ravensthorpe [precise locality withheld for conservation purposes], 5 September 2006, *D.Halford Q9139 & G.Cockerton* (holo: PERTH; iso: BRI).

Beyeria sp. Bandalup Hill (G.Cockerton 7553), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Monoecious, erect **shrubs** to 0.25 m high, resinous on most parts. Young branchlets yellow, ± angular, sparsely hairy; hairs simple, erect, *c.* 0.1 mm long; older branchlets terete, with grey irregularly tessellated bark. **Leaves** petiolate; petioles 0.5–1 mm long, glabrous; blades narrow-oblong to linear, 5–8 mm long, 0.8–1.2 mm wide, length:width ratio 6–9:1; adaxial surface glabrous and ± smooth; abaxial surface hairy with stellate hairs up to 0.5 mm across; base cuneate; margins recurved to midrib concealing abaxial leaf surface; apex rounded to truncate, slightly recurved; midvein obscure adaxially, abaxially raised, flattened and glabrous on abaxial face; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary, solitary; bracts ± triangular, up to 0.4 mm long, acute at apex, glabrous; pedicels ± glabrous or with a few minute hairs proximally, slightly stouter on female flowers than on male flowers; calyx lobes 5, yellow, glabrous, concavo-convex, the margins erose; petals, erect, the margins erose distally; disc of 5 discrete glands; glands fleshy, glabrous. **Male flowers** with pedicels 1–3 mm long; calyx lobes suborbicular to very broad-ovate, *c.* 1.3 mm long and 1.2 mm wide, surrounding androecium at anthesis, rounded to broad-obtuse at apex; petals slightly shorter than or equal to calyx lobes, depressed obovate, *c.* 0.8 mm long and 0.9 mm wide, glabrous abaxially, sparsely to moderately villose adaxially proximally; disc glands *c.* 0.2 mm long, ±truncate or lobed distally, canaliculate adaxially; receptacle 0.8–1.1 mm across, stellate hairy; stamens 10–16; filaments erect, *c.* 0.1 mm long, glabrous, entire or bifid distally; anthers *c.* 0.4 mm long. **Female flowers** with pedicels 1–1.5 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, ovate to broad-ovate, *c.* 1.3 mm long and 0.8 mm wide, acute at apex; petals less than half the length of the calyx lobes, marcescent(?), broad-obovate, *c.* 0.4 mm long and 0.4 mm wide; disc glands *c.* 0.1 mm long, rounded to truncate at apex; ovary ellipsoid, *c.* 0.9 mm long, glabrous, 3-locular; style 0.1–0.3 mm long, glabrous; stigma 3-lobulate, glabrous; lobes erect, triangular, *c.* 0.2 mm long, with margins entire. **Fruits** ± ellipsoid, 3–4 mm long, 2–3 mm across, 1–3-seeded, glabrous, smooth; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 2.5 mm long (including caruncle), 1.5 mm across and *c.* 1 mm in thickness; testa dark brown; caruncle *c.* 0.5 mm long and 0.7 mm wide, pale brown. **Fig. 3.**

***Additional specimens examined*: Western Australia.** [localities withheld] Feb 2003, *Landcare Services GC7553A* (PERTH); Jun 2002, *Cockerton GC7553* (BRI, PERTH).

***Distribution and habitat*:** *Beyeria cockertonii* occurs in south-western Western Australia where it is known only from a single site near Ravensthorpe (**Map 13**). It grows in mallee-heath on shallow rocky clay soils on hill slopes and hilltops.

***Phenology*:** Flowers have been collected in June and September.

***Affinities*:** *Beyeria cockertonii* is morphologically most similar to *B. brevifolia* but can be distinguished by the thin, viscid covering over most parts, shorter habit (up to 0.25 m high compared with up to 1.8 m high), shorter pedicels (1–3 mm long compared with 5–15 mm long), and female flowers with a 3-lobulate rather than calyptriform stigma and a 3-locular rather than 2-locular ovary.

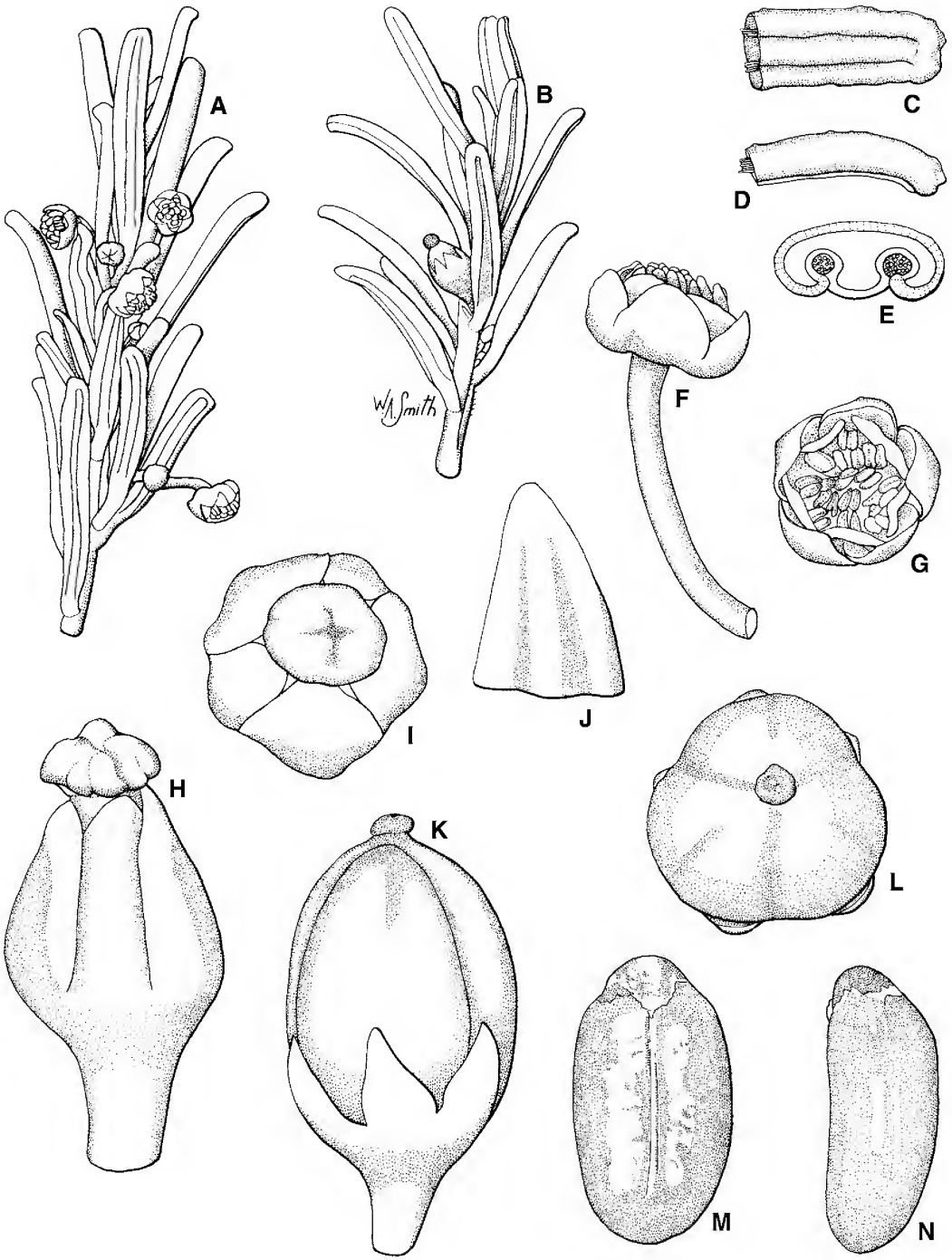

Fig. 3. ***Beyeria cockertonii***. A. branchlet with male flowers × 4. B. branchlet with immature fruit × 4. C. abaxial view of leaf apex × 12. D. side view of leaf apex × 12. E. transverse section of leaf × 24. F. side view of male flower × 12. G. face view of male flower × 12. H. side view of female flower × 24. I. face view of female flower × 22. J. adaxial view of calyx lobe from female flower × 24. K. side view of fruit × 12. L. face view of fruit × 12. M. abaxial view of seed × 16. N. side view of seed × 16. A–N from *Halford Q9139 & Cockerton* (BRI). Del. W.Smith.

***Notes*:** *Beyeria cockertonii* is listed as Declared Rare Flora under the *Western Australian Wildlife Conservation Act 1950*, under the name *Beyeria* sp. Bandalup Hill (G.Cockerton 7553) (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

***Etymology*:** The specific epithet honours Geoff Cockerton (Managing Director, Landcare Services Pty Ltd) who discovered and collected this species and subsequently brought it to our attention.

12. Beyeria constellata Halford & R.J.F.Hend. **species nova** floribus maribus et femineis calyce lobis manifeste carinatis a speciebus omnibus ceteris *Beyeriae* clare distincta. **Typus:** Western Australia. *c.* 4 km E of Cadoux, 14 September 1988, *R.J.F.Henderson H3158* (holo: BRI; iso: K, MEL, PERTH, distribuendi).

Monoecious, erect much-branched **shrubs** to 0.6 m high, resinous on most parts. Young branchlets white to pale green, ± angular becoming terete with age, longitudinally ridged, densely hairy between resinous ridges; hairs stellate, sessile, 0.2–0.3 mm across; older branchlets with grey to black shallowly furrowed bark. **Leaves** petiolate; petioles 0.7–1.3 mm long, hairy adaxially, glabrous abaxially; blades oblong or narrow-elliptic, 10–20 mm long, 2–5 mm wide, length: width ratio 3–7:1; adaxial surface glabrous, minutely papillose (obscured by thick resinous covering); abaxial surface densely hairy with ± sessile, stellate hairs up to 0.8 mm across; base abruptly cuneate; margins recurved to revolute occasionally to midrib concealing abaxial leaf surface; apex rounded or sometimes retuse; midvein impressed adaxially, abaxially prominently raised and flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary or terminal on short axillary branchlets, solitary or rarely 2 per axil; bracts ± foliose, oblong, up to 1 mm long, rounded at apex, ± glabrous adaxially, stellate hairy abaxially; pedicels slender or stout, sparsely hairy proximally with minute erect glandular hairs *c.* 0.1 mm long (mostly obscured by resinous covering); calyx lobes 5, light green to yellow-green with flushes of red especially along the margins, suborbicular, concave adaxially, prominently keeled abaxially, glabrous, the margins usually erose, obtuse to rounded at apex; petals slightly shorter than or equal to calyx lobes, ± erect, glabrous abaxially, densely villose abaxially; disc of 5 discrete glands; glands fleshy, 0.3–0.4 mm long, glabrous, rounded to truncate. **Male flowers** with pedicels 13–16 mm long; calyx lobes 1.6–1.8 mm long, 1.7–2.3 mm wide, surrounding androecium at anthesis; petals transverse-elliptic, 0.5–0.6 mm long, 0.5–0.6 mm wide, with erose margins; receptacle 2–2.5 mm across, stellate hairy; stamens 30–60; filaments erect, 1–1.3 mm long, glabrous, entire or bifid distally; anthers 0.3–0.4 mm long. **Female flowers** with pedicels 8–18 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 1.5–1.8 mm long, 1.6–1.7 mm wide; petals persistent, broad-ovate, 1.4–1.6 mm long, 1.6–1.8 mm wide, with entire margins; ovary subglobose, trigonal, *c.* 1.2 mm long, densely hairy proximally, 3-locular; style 0.5–0.7 mm long, glabrous; stigma ± discoid, 3-lobulate, glabrous, with margins entire, recurved. **Fruits** subglobose, trilobate, 4–6 mm long, 5–6 mm across, mostly 3-seeded, hairy proximally, glabrous, papillose distally (obscured by resinous covering); persistent calyx *c.* half the length of mature fruit. **Seeds** subglobose, dorsi-ventrally compressed, *c.* 3.6 mm long (including caruncle), 3.2 mm across and 2.4 mm in thickness; testa of unknown colour when fresh; caruncle *c.* 1 mm long and 1.5 mm wide, creamy-white. **Fig. 4.**

***Additional specimens examined*: Western Australia.** 5 km W [E] of Cadoux at Johnson road turnoff, Sep 1983, *Purdie 5293* (CANB); Cadoux Pump road, *c.* 7 km E of Cadoux on road to Koorda, near Rabbit Proof Fence road, Sep 2006, *Halford Q9145 & Cockerton* (BRI, MEL, PERTH); no.2 Rabbit Fence, E of Manmanning, Sep 1982, *Smith 129* (CANB, MEL, PERTH).

***Distribution and habitat*:** *Beyeria constellata* is confined to the Cadoux and Manmanning districts in south-western Western Australia (**Map 14**). It grows in scrub with *Eucalyptus oldfieldii* on sand over laterite and in *Eucalyptus* woodland on grey sandy soil.

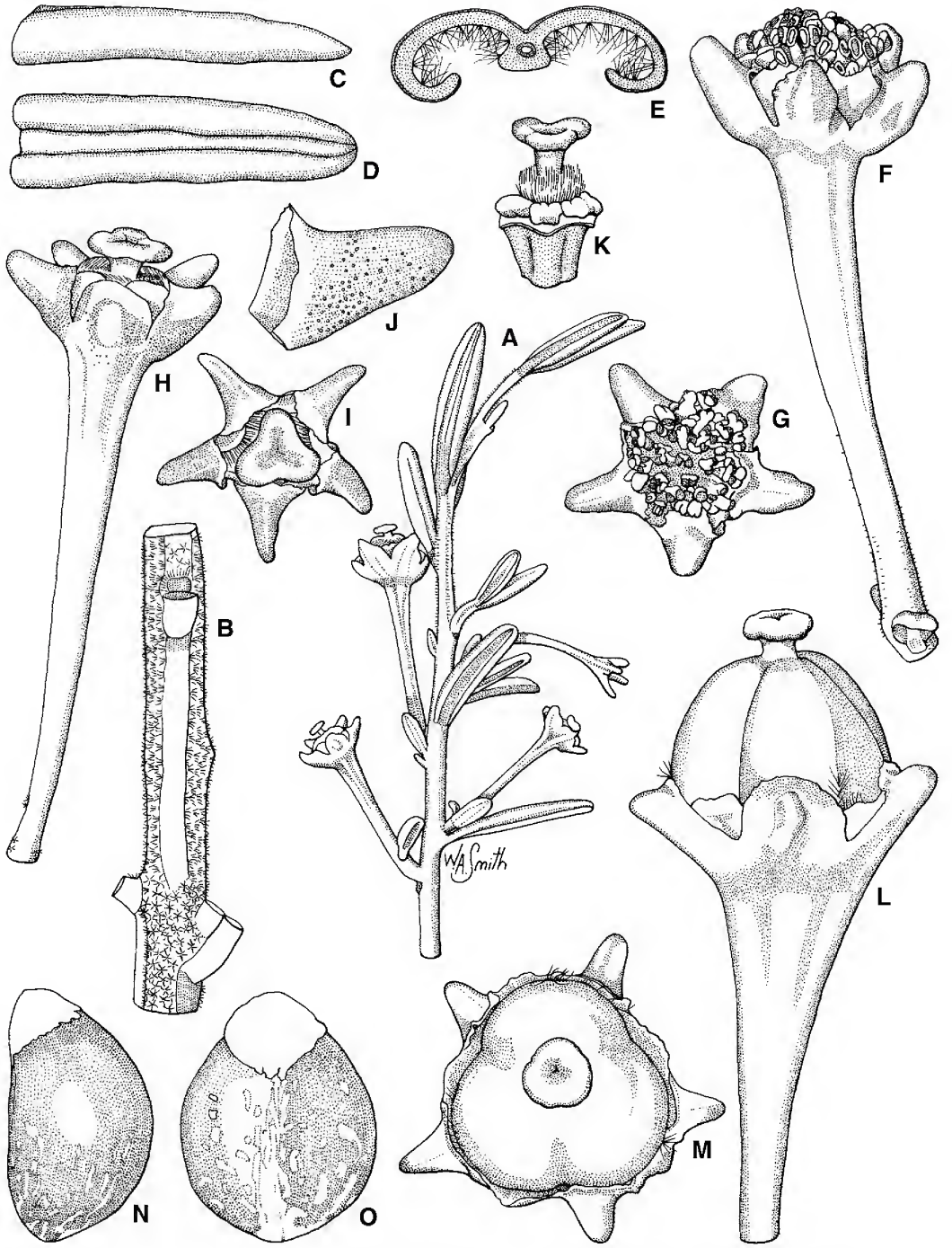

Fig. 4. ***Beyeria constellata***. A. branchlet with female flowers × 2. B. branchlet showing stellate indumentum × 6. C. side view of leaf apex × 6. D. abaxial view of leaf apex × 6. E. transverse section of leaf × 12. F. side view of male flower × 6. G. face view of male flower × 6. H. side view of female flower × 6. I. face view of female flower × 6. J. side view of calyx lobe from female flower × 12. K. side view of female flower with calyx and petals removed, showing disc glands, ovary and style × 6. L. side view of fruit × 6. M. face view of fruit × 6. N. side view of seed × 10. O. abaxial view of seed × 10. A–O from *Henderson H3158* (BRI). Del. W.Smith.

***Phenology*:** Flowers and fruits have been collected in September.

***Affinities*:** *Beyeria constellata* when in flower or fruit is not easily confused with any other species of *Beyeria*. The prominent keel on the calyx lobes of male and female flowers clearly distinguishes it from all other *Beyeria* species.

***Etymology*:** The specific epithet is from Latin, *constellatus*, studded with stars, in reference to the conspicuous star-like appearance of the flowers of this species.

13. Beyeria disciformis Halford & R.J.F.Hend. **species nova** *B. minori* (Airy Shaw) Halford & R.J.F.Hend. maxime affinis nec non *B. calycinae* Airy Shaw affinis. Ab illa foliis laminis longioribus et proportione angustioribus, 10–16 mm longis × 1.3–2.3 mm latis non 5–10 mm longis × 1.6–2.5 mm latis, angusti-oblongis usque ad linearis non angusti-oblongis usque ad angusti-ellipticis, floribus femineis stigmate minore, 0.1–0.3 mm lato non 0.7–0.9 mm lato, pedicellis glandulosis pubescentibus non glabris et bracteis ovatis et dense pubescentibus adaxialiter non angusti-oblongis et plene glabris differt. Ab hac foliorum laminis et petiolis et bracteis brevioribus et floribus et fructibus plerumque parvioribus differt. **Typus:** Western Australia. *c.* 2 km from Buntine along road to Wubin, 13 September 1988, *R.J.F.Henderson H3155* (holo: BRI; iso: CANB, K, MEL, PERTH, distribuendi).

Monoecious, spreading, much-branched **shrubs** to 1 m high, resinous on most parts. Young branchlets pale green, ± angular becoming terete with age, longitudinally grooved, glabrous; older branchlets with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 0.5–1 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades narrow-oblong to linear, 10–16 mm long, 1.3–2.3 mm wide, length:width ratio 6–8:1, recurved distally; adaxial surface glabrous, minutely papillose (usually obscured by resinous covering); abaxial surface densely hairy with ± sessile, stellate hairs up to 0.6 mm across; base cuneate; margins recurved to midrib concealing abaxial leaf surface; apex rounded or obtuse, ultimately apiculate with extension from midrib; apiculum stout, 0.3–0.6 mm long, recurved; midvein slightly raised or impressed adaxially, abaxially prominently raised and flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands occasionally present on blade, up to 2 mm from base, 1 per side of midrib, sessile, smooth, up to 0.2 mm across. **Flowers** pedicellate, axillary, solitary; bracts ovate, 0.5–1.3 mm long, cymbiform, acute at apex, glabrous abaxially, densely hairy with weakly ascending, simple hairs up to 0.3 mm long adaxially; pedicels slender, sparsely hairy proximally with minute erect glandular hairs *c.* 0.05 mm long; calyx lobes 5, pale green, suborbicular to very broad-ovate, glabrous, concavo-convex, the margins entire or erose, obtuse to rounded at apex; petals slightly shorter than or equal to calyx lobes, concavo-convex, the margins erose; disc obscure or absent. **Male flowers** with pedicels 2–4 mm long; calyx lobes 0.8–1.3 mm long, 1.4–1.7 mm wide, surrounding androecium at anthesis; petals suborbicular, 0.7–1.1 mm long, 0.8–1.4 mm wide, glabrous abaxially, densely villose adaxially proximally; receptacle 0.9–1.1 mm across, minutely hairy; stamens 15; filaments erect, 0.2–0.4 mm long, glabrous, entire or bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with pedicels 2–6 mm long; calyx lobes accrescent, ± appressed to and enclosing gynoecium apart from stigma, 1.4–2 mm long (2–3 mm long in fruit), 1.7–2.4 mm wide; petals marcescent, suborbicular to broad-obovate, 0.8–1.5 mm long, 1–1.5 mm wide, glabrous abaxially, densely villose adaxially; ovary subglobose, trigonal, 0.9–1.1 mm long, glabrous, 3-locular; style *c.* 0.1 mm long, glabrous; stigma discoid, 0.1–0.3 mm across, glabrous, with margins entire. **Fruits** subglobose, 3.5–4 mm long, 3–4 mm across, 2- or 3-seeded, glabrous, smooth; persistent calyx one half to two thirds the length of mature fruit. Seed not seen. **Fig. 5.**

***Additional specimens examined*: Western Australia.** 2 miles [*c.* 3 km] N of Wubin, Sep 1966, *Knox 660902* (PERTH); Wubin, Oct 1965, *Knox 651043* (PERTH).

***Distribution and habitat*:** *Beyeria disciformis* is known only from the vicinity of Wubin in south-western Western Australia (**Map 15**).

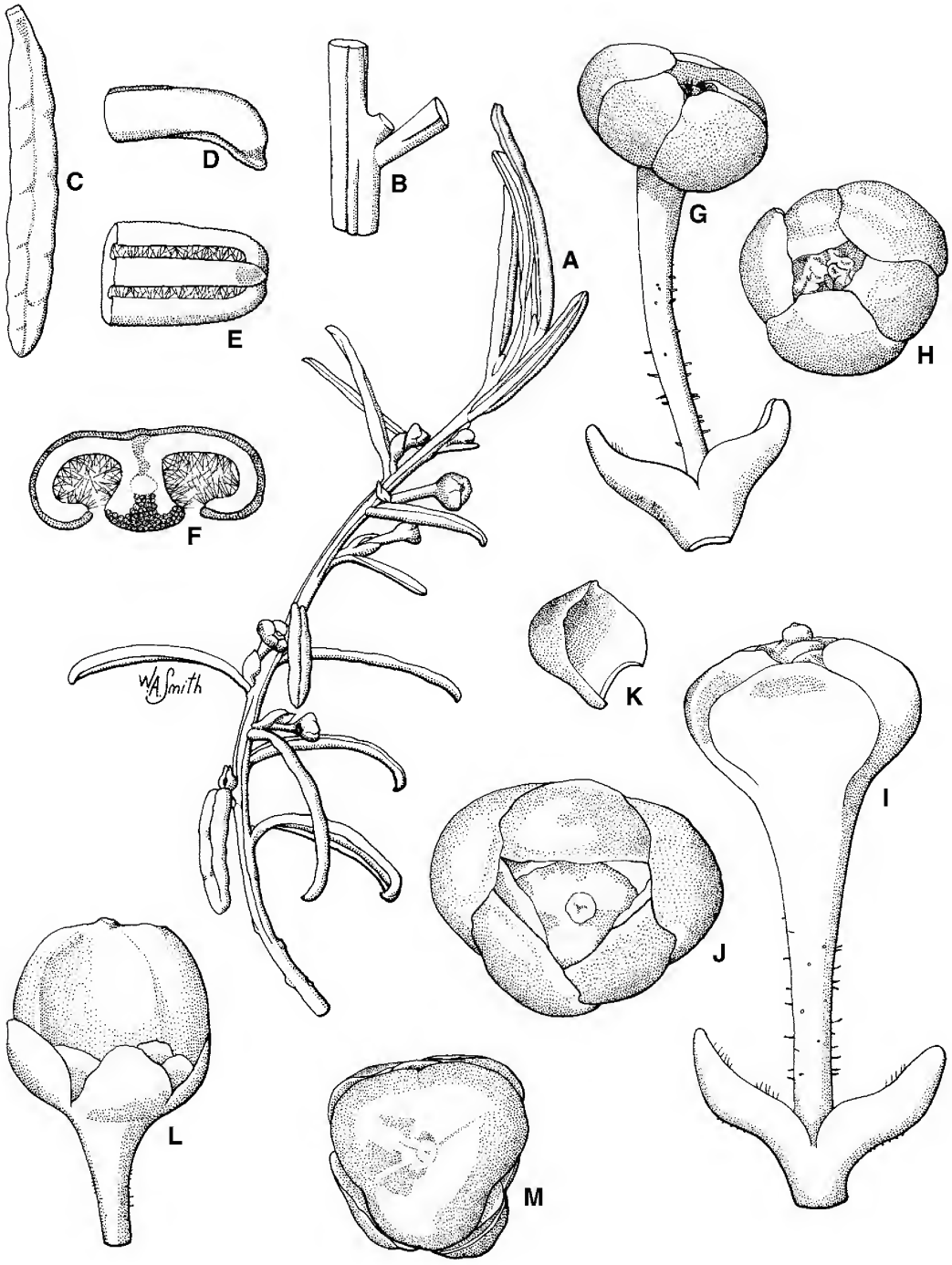

Fig. 5. ***Beyeria disciformis***. A. branchlet with male and female flowers × 2. B. branchlet showing longitudinal grooves × 6. C. adaxial view of leaf × 4. D. side view of leaf apex × 12. E. abaxial view of leaf apex × 12. F. transverse section of leaf × 24. G. side view of male flower with bracts × 12. H. face view of male flower × 12. I. side view of female flower with bracts × 12. J. face view of female flower × 12. K. side view of calyx lobe from female flower × 12. L. side view of fruit × 6. M. face view of fruit × 6. A–M from *Henderson H3155* (BRI). Del. W.Smith.

It grows on hard red loamy soil in remnant *Acacia/Hakea/Eucalyptus* shrubland.

***Phenology*:** Flowers have been collected in September and October, fruits in October.

***Affinities*:** *Beyeria disciformis* is similar to *B. minor* (Airy Shaw) Halford & R.J.F.Hend. and *B. calycina*. It differs from the former in having longer and proportionally narrower leaf blades, a different leaf blade shape, smaller stigmas, glandular hairy pedicels and ovate bracts which are densely hairy adaxially compared with narrow-oblong and wholly glabrous bracts in *B. minor*. *Beyeria disciformis* differs from *B. calycina* in having generally shorter leaf blades, petioles and bracts and generally smaller flowers and fruits. These differences are summarized in **Table 1**.

Table 1. Comparison of morphological characters for *Beyeria disciformis*, *B. minor* and *B. calycina*

Character	*B. disciformis*	*B. minor*	*B. calycina*
leaf shape	narrow-oblong to linear	narrow-oblong to narrow-elliptic	linear
leaf dimensions (mm)	10–16 × 1.3–2.3	5–10 × 1.6–2.5	15–35 × 2–3
petiole length (mm)	0.5–1	0.6–1.2	0.8–2
stigma width (mm)	0.1–0.3	0.7–0.9	*c.* 0.3
pedicel	glandular hairy proximally	glabrous	with scattered hairs proximally
bract shape bract dimensions (mm)	ovate 0.5–1	narrow-oblong 0.6–1.1	ovate 3–4
bract adaxial surface	hairy	glabrous	hairy
calyx lobe length (mm) in male flower in female flower	 0.8–1.3 1.4–2	 *c.* 1.5 *c.* 2.5	 1.2–1.5 2–3.5
petal length (mm) in male flower in female flower	 0.7–1.1 0.8–1.5	 *c.* 1 0.9–1	 *c.* 1.5 2–2.5
fruit dimensions (mm)	3.5–4 × 3–4	4.5–5.5 × 4–5	*c.* 4.5 × 4–4.5

***Etymology*:** The specific epithet is from Latin *disciformis*, disk-like, and refers to the shape of the stigma in this species.

14. Beyeria gardneri Airy Shaw, *Kew Bull.* 26: 68–69 (1971). **Type:** Western Australia. Irwin District: Murchison River, 30 August 1931, *C.A.Gardner 2588* (holo: PERTH; iso: PERTH).

Monoecious, slender, open **shrubs** to 0.7 m high, usually resinous on most parts. Young branchlets of unknown colour when fresh, terete, glabrous, tuberculate; older branchlets with greyish white shallowly fissured bark. **Leaves** petiolate; petioles 0.8–2 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades narrow-oblong to linear, 5–16 mm long, 0.8–1.4 mm wide, length:width ratio 6–12:1; adaxial surface glabrous, sparsely tuberculate; abaxial surface densely hairy with hairs < 0.05 mm long; base cuneate; margins recurved to midrib concealing abaxial leaf surface; apex obtuse to rounded, recurved; midvein obscure adaxially, abaxially raised and rounded, glabrous; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary, solitary or fasciculate

in 2- or 3-flowered fascicles; bracts ovate, up to 0.8 mm long, acute at apex, ± glabrous; pedicels ± glabrous, stouter on female flowers than on male flowers; calyx lobes 5, yellowish green, suborbicular to very broad-ovate, glabrous, concave adaxially, gibbose abaxially, the margins entire, rounded to obtuse at apex; petals slightly shorter than or equal to calyx lobes, erect, suborbicular or very broad-ovate, glabrous abaxially, sparsely to moderately villose adaxially, the margins ± entire; disc of 5 discrete glands; glands thin, ± oblong, 0.3–0.6, dorsi-ventrally compressed, glabrous, acute to rounded. **Male flowers** with pedicels 1–2 mm long; calyx lobes 0.5–0.9 mm long, 0.9–1.3 mm wide, surrounding androecium at anthesis; petals 0.5–0.9 mm long, 0.9–1 mm wide; receptacle *c.* 0.8 mm across, minutely hairy; stamens 10–12; filaments erect, 0.1–0.4 mm long, glabrous, bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with pedicels 1–3 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 0.9–1.3 mm long, 1.3–1.4 mm wide; petals marcescent, *c.* 1.3 mm long and 1.1 mm wide; ovary ellipsoid, ± bilobate, *c.* 1 mm long, glabrous, 2-locular, with 4 short subapical appendages; style ± obsolete; stigma discoid, 0.4–0.5 mm across, glabrous, with margins entire. **Fruits** subellipsoid, ± laterally compressed when 2-seeded, 4–5.5 mm long, 4.5–5.5 mm across, with 2 or rarely 4 horn-like subapical appendages, 1- or rarely 2-seeded, glabrous, smooth; persistent calyx *c.* one fifth the length of mature fruit; subapical appendages up to 1 mm long. **Seeds** subglobose, slightly dorsi-ventrally compressed, *c.* 4 mm long (including caruncle), 2.8–3 mm across, 2.7–3 mm in thickness; testa light to dark brown; caruncle *c.* 1.2 mm long and 0.7 mm wide, creamy-white.

***Additional specimens examined*: Western Australia.** [localities withheld] Aug 1961, *Gardner 13318* (PERTH); Aug 1931, *Gardner 2588* (PERTH); Aug 1931, *Gardner & Blackall 598* (PERTH); Sep 1983, *Purdie 5220* (CANB); Oct 1963, *Chadwick 1672* (PERTH); Sep 1970, *Chapman 1292* (PERTH); Sep 1991, *Cranfield & Spencer 8068* (CANB); Sep 1977, *Hnatiuk 771198* (PERTH); Sep 1988, *Griffin 5229* (PERTH); Oct 1971, *Royce 9615* (PERTH).

***Distribution and habitat*:** *Beyeria gardneri* is confined to subcoastal areas from Kalbarri southwards to Badgingarra and Watheroo in south-western Western Australia (**Map 16**). It grows in open heathland and shrubland communities on sandy soils mostly on undulating sand plains.

***Phenology*:** Flowers and fruits have been collected from August to October.

***Affinities*:** *Beyeria gardneri* is morphologically most similar to *B. similis* (Müll.Arg.) Benth. and both these species have fruits with subapical appendages which distinguishes them from other species of *Beyeria*. *Beyeria gardneri* differs from *B. similis* in having generally smaller leaf blades, shorter pedicels and shorter subapical appendages on its fruits. These differences are summarized in **Table 2**.

***Notes*:** *Beyeria gardneri* is listed as Priority One under DEC Conservation Codes for Western Australian Flora (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

Table 2. Comparison of morphological characters for *Beyeria gardneri* and *B. similis*

Character	*B. gardneri*	*B. similis*
leaf dimensions (mm)	5–16 × 0.8–1.4	20–50 × 1.6–2.5
pedicel length (mm) of male flowers of female flowers	 1–2 1–3	 2–3 5–10
fruit: subapical appendage length (mm)	up to 1	up to 2

15. Beyeria lapidicola Halford & R.J.F.Hend. **species nova** *B. disciformi* Halford & R.J.F.Hend. et *B. minori* (Airy Shaw) Halford & R.J.F.Hend. maxime affinis. Ab illa floribus pedicello 7–13 mm longo non 2–6 mm longo et bracteis oblongis, plusminusve foliosis et adaxialiter glabris non ovatis cymbiformibus et adaxialiter dense pubescentibus differt. Ab hac calycis lobis ovatis usque lato-ovatis non suborbicularibus vel lato-ovatissimis, floribus femineis stigmate 0.4–0.6 mm lato non 0.7–0.9 mm lato, folii apice obtuso non obtuso-apiculato et floribus femineis fructiferis calycis lobis non auctis differt. **Typus:** Western Australia. near Wiluna [precise locality withheld for conservation purposes], 18 August 2006, *A.Markey & S.Dillon 4114* (holo: PERTH).

Beyeria sp. Murchison (B. Jeanes s.n. 7/7/2005), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Monoecious, spreading, much-branched **shrubs** to 1 m high, resinous on most parts. Young branchlets pale yellowish green, ± angular becoming terete with age, sometimes shallowly longitudinally grooved, glabrous; older branchlets with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 1–1.6 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades narrow-oblong, 8–16 mm long, 1.4–2 mm wide; adaxial surface glabrous, minutely papillose (usually obscured by resinous covering); abaxial surface densely hairy with ± sessile, stellate hairs up to 0.3 mm across; base cuneate; margins recurved to midrib usually concealing abaxial leaf surface; apex rounded, ultimately apiculate (usually obscured by resinous covering) with extension from midrib; apiculum stout, up to 0.1 mm long; midvein slightly impressed adaxially, abaxially prominently raised and flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary or terminal on short axillary branchlets, solitary; bracts oblong, ± foliose, up to 2.5 mm long, rounded at apex, glabrous adaxially, stellate hairy abaxially; pedicels slender, papillose (mostly obscured by resinous covering), stouter on female flowers than on male flowers; calyx lobes 5, pale green, ovate to broad-ovate, glabrous, concavo-convex, the margins entire or erose, obtuse to rounded at apex; petals slightly shorter than calyx lobes, ± flat, the margins entire; disc of 5 discrete glands; glands fleshy, 0.2–0.3 mm long, laterally compressed, glabrous, truncate. **Male flowers** with pedicels 7–11 mm long; calyx lobes 1.2–1.4 mm long, 1.4–1.7 mm wide, surrounding androecium at anthesis; petals orbicular, *c.* 1 mm long and 1 mm wide, glabrous abaxially, sparsely villose adaxially; receptacle *c.* 1 mm across, minutely hairy; stamens 20; filaments erect, 0.2–0.4 mm long, glabrous, entire or bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with pedicels 7–13 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 1.1–2 mm long, 0.9–1.5 mm wide; petals marcescent, suborbicular, 0.7–1 mm long, *c.* 0.7 mm wide, glabrous abaxially, densely villose adaxially; ovary subglobose, trigonal, *c.* 1.5 mm long, glabrous, 3-locular; style ± obsolete; stigma calyptriform, 0.4–0.6 mm across, glabrous, with margins shallowly lobed. **Fruits** ± ellipsoid, *c.* 4.5 mm long and 4 mm across, 2- or 3-seeded, glabrous, smooth; persistent calyx *c.* one fifth the length of mature fruit. Seed not seen. **Fig. 6.**

***Additional specimens examined*: Western Australia.** [precise localities withheld] Jul 2006, *Capobianco AC702-14* (BRI); Sep 2006, *Meissner 736 & Bayliss* (PERTH); Sep 2006, *Meissner 737 & Bayliss* (BRI); Jul 2005, *Jeanes s.n.* (BRI).

***Distribution and habitat*:** *Beyeria lapidicola* occurs on banded ironstone ranges near Meekatharra, Wiluna and Menzies in south-western Western Australia (**Map 17**). It grows in shrubland communities of *Callitris glaucophylla* and *Acacia* spp. or *Acacia aneura* on sandy loam soils, mostly on banded ironstone hills.

***Phenology*:** Flowers and fruits have been collected from July to September.

***Affinities*:** *Beyeria lapidicola* is most similar to *B. disciformis* and *B. minor* (Airy Shaw) Halford & R.J.F.Hend. It differs from *B. disciformis* in having fruit with longer pedicels which are 7–13 mm long compared with 2–6 mm long, bracts which are oblong, ± foliose and glabrous adaxially compared

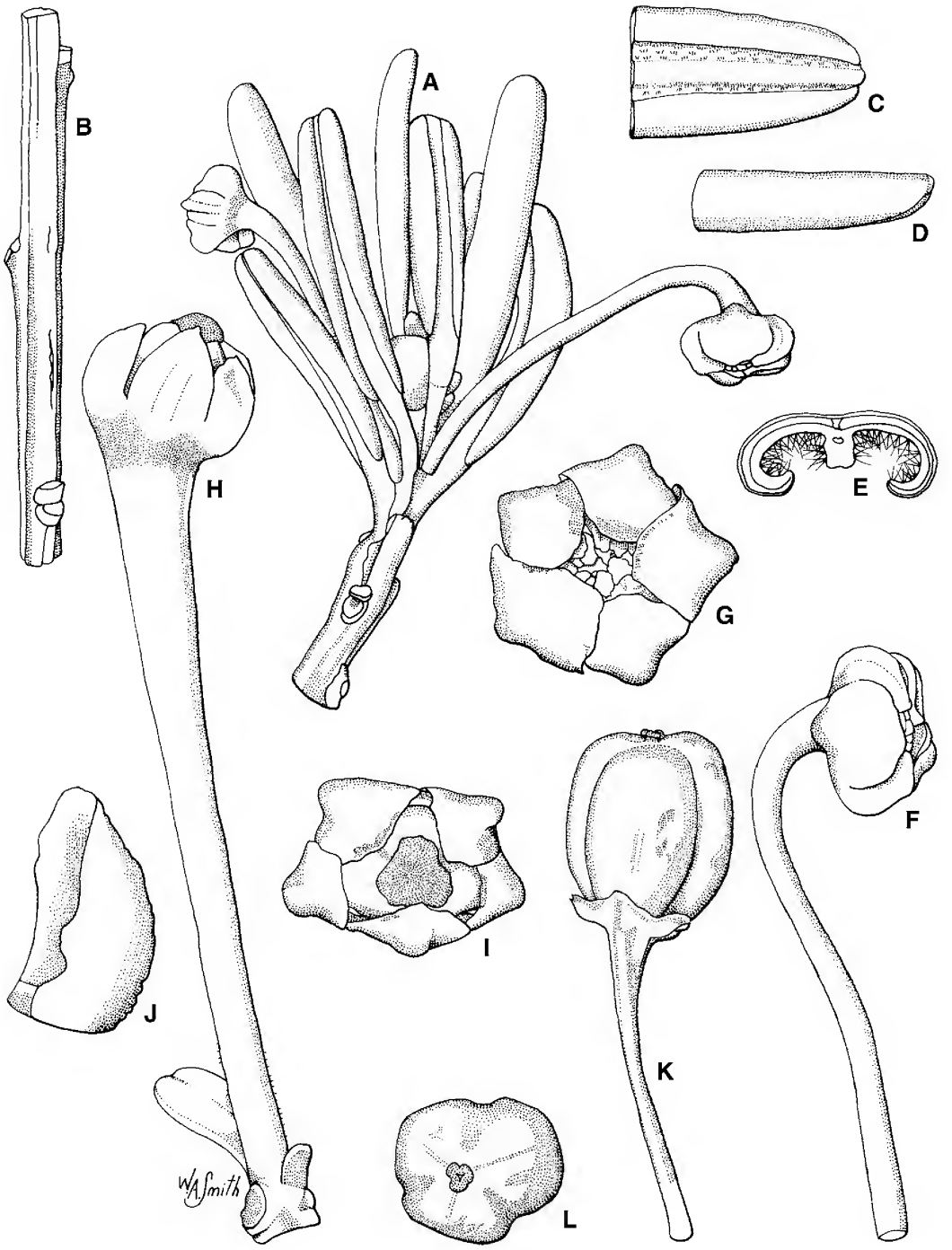

Fig. 6. ***Beyeria lapidicola***. A. branchlet with male flowers × 6. B. branchlet showing longitudinal grooves × 4. C. abaxial view of leaf apex × 9. D. side view of leaf apex × 9. E. transverse section of leaf × 12. F. side view of male flower × 9. G. face view of male flower × 12. H. side view of female flower × 9. I. face view of female flower × 12. J. side view of calyx lobe from female flower × 24. K. side view of fruit × 6. L. face view of fruit × 6. A, C–G from *Meissner 737 & Bayliss* (BRI); B, H–J from *Jeanes s.n.*, Jul 2005 (BRI); K & L from *Markey 4114 & Dillon* (PERTH). Del. W.Smith.

with ovate, cymbiform bracts that are densely hairy adaxially and calyx lobes that do not enlarge as the fruit matures. It differs from *B. minor* in having the calyx lobes shaped differently (ovate to broad-ovate compared with suborbicular or very broad-ovate), female flowers with a smaller stigma which is 0.4–0.6 mm across compared with 0.7–0.9 mm across, an evenly rounded rather than an obtuse and apiculate leaf apex and calyx lobes that do not enlarge as the fruit matures.

***Notes*:** *Beyeria lapidicola* is listed as Priority Two under DEC Conservation Codes for Western Australian Flora, under the name *Beyeria* sp. Murchison (B. Jeanes s.n. 7/7/2005) (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

***Etymology*:** The specific epithet is derived from Latin *lapis*, stone, and *-cola*, dweller or inhabitant, in reference to the banded ironstone hills where this species has been recorded as growing.

16. Beyeria latifolia Baill., *Adansonia* 6: 304 (1866). **Type:** [Western Australia.] stony gully west from Mt Bland, *s.d.*, *s.coll.* (lecto [here chosen]: MEL 114159).

Beyeriopsis latifolia Müll.Arg., *Linnaea* 34: 57 (1865). **Type:** [Western Australia.] Point Henry, *s.d.*, [*A.F.*] *Oldfield s.n.* (lecto [here chosen]: G-DC *n.v.* [microfiche IDC 800-73 2454 II. 3, top element]; isolecto: K, MEL 114160).

Monoecious sometimes dioecious, spreading, much-branched **shrubs** to 0.7 m high, sometimes resinous on young shoots and flower buds. Young branchlets pale green, ± terete, densely hairy; hairs stellate, stipitate or sessile, *c.* 0.4 mm across; older branchlets with grey shallowly fissured bark. **Leaves** petiolate; petioles 4–7 mm long, sparsely to densely hairy with stellate hairs as for branchlets; blades ovate to broad-ovate, 10–30 mm long, 6–12 mm wide, length:width ratio 1.5–3:1; adaxial surface glabrous or with scattered stipitate stellate hairs *c.* 0.4 mm across, becoming glabrous with age, smooth or with scattered tubercles from persistent hair bases; abaxial surface densely hairy with ± sessile, stellate hairs *c.* 1 mm across; base obtuse to truncate; margins recurved to revolute; apex obtuse to rounded; midvein slightly impressed adaxially, abaxially raised, sparsely to densely hairy; secondary veins obscure adaxially, abaxially raised; tertiary veins obscure; marginal glands rarely present on blade, up to 1 mm from blade base, 1 per side of midrib, ± sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, axillary, solitary; bracts ± ovate, *c.* 0.9 mm long, acute at apex, stellate hairy; pedicels sparsely to densely hairy with hairs as for branchlets, slightly stouter on female flowers than on male flowers; calyx lobes 5, yellowish green, suborbicular or ovate, concave and glabrous adaxially, gibbose with a few stellate hairs abaxially, the margins erose, rounded to obtuse to acute at apex; petals slightly shorter than or equal to calyx lobes, erect, suborbicular or depressed elliptic, glabrous abaxially, sparsely villose adaxially; disc of 5 discrete glands; glands fleshy, dorsi-ventrally compressed, *c.* 0.3 mm long, glabrous, truncate or irregularly lobed. **Male flowers** with pedicels 5–10 mm long; calyx lobes 1.5–1.7 mm long, 0.9–1.5 mm wide, surrounding androecium at anthesis; petals 0.5–1.5 mm long, 1.2–1.8 mm wide, the margins erose distally; receptacle *c.* 1 mm across, minutely hairy; stamens 9–11; filaments erect, 0.1–0.3 mm long, glabrous, bifid distally; anthers *c.* 0.4 mm long. **Female flowers** with pedicels 3–11 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 0.5–1 mm long, 0.7–1.4 mm wide; petals marcescent, 0.7–0.9 mm long, 0.7–0.9 mm wide, the margins entire; ovary ± ellipsoid, 0.9–1.3 mm long, densely stellate hairy, 2- or 3-locular; style ± obsolete; stigma calyptriform, 0.8–1 mm across, shallowly umbilicate, glabrous, with margins entire. **Fruits** ± ovoid, 6–6.5 mm long, 4–5.5 mm across, 1–3-seeded, sparsely hairy; persistent calyx *c.* one tenth the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 6 mm long (including caruncle), 3 mm across and 2.5 mm in thickness; testa light to dark brown; caruncle *c.* 2 mm long and 1 mm wide, light brown.

***Additional specimens examined*: Western Australia.** Gairdner River, Qualup [?], Oct 1928, *Gardner 2225* (PERTH); 20 miles [*c.* 32 km] W of Salmon Gums, Jan 1977, *Wittwer W2000* (PERTH); SE of Middle Mt Barren, Fitzgerald River Reserve, Dec 1970, *George*

10590 (CANB, PERTH); 2 km S of Thumb Peak, Fitzgerald River N.P., Oct 1976, *Newbey 4845* (CANB); West Mt Barren, Oct 1963, *Aplin 2769* (PERTH); *ibid*, Nov 1960, *George 1786* (PERTH); *ibid*, Oct 1965, *George s.n.* (PERTH); Mt Bland, Res. 24048, Jul 1970, *George 10055* (PERTH).

***Distribution and habitat*:** *Beyeria latifolia* is confined to the south coast of Western Australia where it occurs east of Albany from Point Henry north-east to Thumb Peak in the Fitzgerald River National Park, with a disjunct population near Salmon Gums (**Map 18**). It grows in coastal scrub and mallee scrub communities on mostly sandy soils in sheltered sites.

***Phenology*:** Flowers have been collected in January, July and from October to December, fruits in October and November.

***Affinities*:** *Beyeria latifolia* is morphologically most similar to *B. cinerea* and *B. lepidopetala* F.Muell. *Beyeria latifolia* differs from the former by its leaf blade size, and fruit shape and size. *Beyeria latifolia* can be distinguished from *B. lepidopetala* by its leaf blade shape and size and shorter pedicels on female flowers. These differences are summarized in **Table 3**.

Table 3. Comparison of morphological characters for *Beyeria latifolia, B. cinerea* and *B. lepidopetala*

Character	*B. latifolia*	*B. cinerea*	*B. lepidopetala*
leaf dimensions (mm)	10–30 × 6–12	3–17 × 1.2–5	15–20 × 1.5–3
leaf shape	ovate to broad-ovate	narrow-ovate to broad-ovate, narrow-elliptic, triangular	linear
pedicel length (mm) of female flowers	3–11	1–7	10–30
fruit dimensions (mm) fruit shape	6–6.5 × 4–5.5 ovoid	4–6 × 2.5–3.8 pyriform	fruit not seen

***Typification*:** In the protologue of *Beyeria latifolia*, Baillon (1866) cited three syntypes "*Oldfield*, n. 831, in vallibus umbrosis ad Portum Henry, Austral. austr.-occid.; *Lare?* in lapidosis orient. Montis Bland (herb. *F.Muell.*).; *Drummond*, Swan-River (ser. 4, n. 216?)". Two sheets of what is considered to be type material have been located in material loaned to BRI from MEL. These sheets are: Point Henry, *Oldfield 831* [114160] and Mt Bland, [114159]. In the absence of further suitable material, the collection from Mt Bland [114159] is here selected as lectotype of this name.

In the protologue of *Beyeriopsis latifolia*, Müller (1865) cited two collections "Point Henry (Oldfield, comm, Dr, F. Muell. in herb. DC!)" and "Swan River (Drummond ser. 4. n. 216!)". These collections are mounted on a single sheet in G-DC. The Oldfield collection is selected as lectotype of this name. The Oldfield collection in G-DC has the date 1863 on the lower edge of the Botanical Museum of Melbourne label. This we believed is the year in which the material was received by Müller Argoviensis from F. Mueller and is not the date of its collection.

17. Beyeria lepidopetala F.Muell., *Fragm.* 1: 230 (1859); *Beyeriopsis lepidopetala* (F.Muell.) Müll.Arg., *Linnaea* 34: 57 (1865). **Type:** [Western Australia.] Murchison, *s.d.*, *A.*[*F.*] *Oldfield s.n.* (lecto [here chosen]: MEL 98605; isolecto: K, MEL [2 sheets 114318, 2062919]).

***Illustration*:** Hopper *et al.* (1990: 83).

Monoecious or dioecious, erect, open **shrubs** to 4 m high. Young branchlets of unknown colour when fresh, terete, densely hairy, becoming glabrous with age though

remaining tuberculate by persistent hair bases; hairs stellate, shortly stipitate, up to 0.5 mm across; older branchlets with grey shallowly furrowed bark. **Leaves** petiolate; petioles 1–2 mm long, hairy with indumentum as for branchlets; blades linear, 15–20 mm long, 1.5–3 mm wide, length: width ratio 5–10:1; adaxial surface sparsely hairywith stipitate stellate hairs *c.* 0.4 mm across, becoming glabrous with age though remaining sparsely tuberculate by persistent hair bases; abaxial surface densely hairy with ± sessile, stellate hairs *c.* 0.5 mm across; base cuneate or obtuse; margin revolute or recurved usually to midrib concealing abaxial leaf surface; apex obtuse to acute; midvein slightly impressed adaxially, abaxially raised, densely stellate hairy; secondary and tertiary veins obscure; marginal glands occasionally present at base of blade, 1 per side of midrib, sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, axillary, solitary; bracts foliose, up to 5 mm long; pedicels sparsely stellate hairy, slightly stouter and longer on female flowers than on male flowers; calyx lobes 5, of unknown colour when fresh, suborbicular or broad-ovate, glabrous, concavo-convex, the margins erose, rounded at apex; petals slightly shorter than calyx lobes, erect, suborbicular, glabrous abaxially, sparsely villose adaxially, the margins erose distally; disc of 5 discrete glands; glands fleshy, 0.4–0.5 mm long, glabrous, rounded. **Male flowers** with pedicels 8–10 mm long; calyx lobes *c.* 1.5 mm long and 1.5 mm wide, surrounding androecium at anthesis; petals *c.* 1.1 mm long and 1.4 mm wide; receptacle 0.8–1 mm across, minutely hairy; stamens 50; filaments erect, *c.* 0.2 mm long, glabrous, bifid distally; anthers *c.* 0.2 mm long. **Female flowers** with pedicels 10–30 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, *c.* 1.5 mm long and 1.5 mm wide; petals marcescent, *c.* 1 mm long and 1.2 mm wide; ovary ellipsoid, *c.* 1 mm long, densely stellate hairy, 3-locular; style ± obsolete; stigma discoid, *c.* 0.8 mm across, glabrous, deeply tri-sulcate with margins entire. Mature fruit and seed not seen.

***Additional specimens examined*: Western Australia.** [localities withheld] Aug 2003, *Wildflower Society Bushland Survey GDNI/56* (BRI); Aug 1974, *Cranfield 9326* (PERTH).

***Distribution and habitat*:** *Beyeria lepidopetala* is known only from a small area near Geraldton, Western Australia (**Map 19**). It grows on yellow sandy clay.

***Phenology*:** Flowers have been collected in August.

***Affinities*:** *Beyeria lepidopetala* is morphologically most similar to *B. cinerea* and *B. latifolia*. It can be separated from both species by its leaf shape and size and pedicel length of the female flowers. These differences are summarized in **Table 4**.

Table 4. Comparison of morphological characters for *Beyeria lepidopetala, B. latifolia* and *B. cinerea*

Character	*B. lepidopetala*	*B. cinerea*	*B. latifolia*
leaf dimensions (mm)	15–20 × 1.5–3	3–17 × 1.2–5	10–30 × 6–12
leaf shape	linear	narrow-ovate to broad-ovate narrow-elliptic, triangular	ovate to broad-ovate
pedicel length (mm) of female flowers	10–30	1–7	3–11

***Typification*:** In the protologue of *Beyeria lepidopetala*, Mueller (1865) cited a single collection "In locis rupestribus ad flumen Murchison. *A. Oldfield*". Four sheets of what is considered to be original material have been located (three at MEL [98605, 114318 and 2062919] and one at K). The MEL sheet [98605] is selected here as lectotype of this

name because it is an ample specimen and has morphology that agrees with the description in the protologue.

***Notes*:** Listed as Declared Rare Flora under the *Western Australian Wildlife Conservation Act 1950* (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

18. Beyeria minor (Airy Shaw) Halford & R.J.F.Hend. **combinatio et status nova**

Basionym: *Beyeria calycina* var. *minor* Airy Shaw, *Kew Bull.* 26: 70–71 (1971). **Type:** Western Australia. 85 miles [*c.* 136 km] E of Merredin, October 1964, *P.R.Jefferies 641006* (holo: PERTH; iso: PERTH).

Monoecious, erect **shrubs** to 0.8 m high, resinous on most parts. Young branchlets of unknown colour when fresh, ± angular, longitudinally grooved, glabrous, thickly resinous; older branchlets terete, with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 0.6–1.2 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades narrow-oblong to narrow-elliptic, 5–10 mm long, 1.6–2.5 mm wide, length:width ratio 3–4:1; adaxial surface glabrous, minutely papillose (usually obscured by resinous covering); abaxial surface densely hairy with ± sessile, stellate hairs up to 0.9 mm across; base obtuse; margins recurved to midrib concealing abaxial leaf surface; apex rounded or obtuse, ultimately apiculate with extension from midrib; apiculum stout, up to 0.5 mm long, bent upward; midvein obscure or slightly raised adaxially, abaxially prominently raised and flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands occasionally present on blade, up to 1 mm from blade base, 1 per side of midrib, sessile, smooth, up to 0.2 mm across. **Flowers** pedicellate, axillary, solitary; bracts narrow-oblong, 0.6–1.1 mm long, acute at apex, glabrous; pedicels glabrous, papillose usually obscured by resinous covering, stouter and longer on female flowers than on male flowers; calyx lobes 5, of unknown colour when fresh, suborbicular to very broad-ovate, glabrous, concavo-convex, obtuse to rounded at apex; petals slightly shorter than or equal to calyx lobes, suborbicular to oblate, erect, glabrous abaxially, densely villose adaxially proximally, the margins erose; disc obscure or absent in male flowers, of 5 discrete glands in female flowers. **Male flowers** with pedicels 2–6 mm long; calyx lobes *c.* 1.5 mm long and 2 mm wide, the margins erose, surrounding androecium at anthesis; petals *c.* 1 mm long, and 1.3 mm wide; receptacle *c.* 1.5 mm across, minutely hairy; stamens 20; filaments erect, *c.* 0.3 mm long, glabrous, entire or bifid distally; anthers *c.* 0.4 mm long. **Female flowers** with pedicels 5–9 mm long; calyx lobes somewhat accrescent, ± appressed to and enclosing gynoecium apart from stigma, *c.* 2.5 mm long (*c.* 3 mm long in fruit) and 2.6 mm wide, the margins entire; petals marcescent, 0.9–1 mm long, 1.3–1.5 mm wide; disc glands fleshy, ovate, *c.* 0.4 mm long, dorsi-ventrally compressed, glabrous, rounded; ovary subglobose, *c.* 1.2 mm long, glabrous, 3-locular; style *c.* 0.1 mm long, glabrous; stigma discoid to calyptriform, 0.7–0.9 mm across, glabrous, with margins entire, ± incurved. **Fruits** subglobose, 4.5–5.5 mm long, 4–5 mm across, mostly 2- or 3-seeded, glabrous, smooth; persistent calyx *c.* half the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 3.5–4.2 mm long (including caruncle), 2.6–2.9 mm across, 2–2.2 mm in thickness; testa light to dark brown; caruncle *c.* 0.7 mm long and 1 mm wide, creamy-white.

***Additional selected specimens examined*: Western Australia.** 6 km N of Hickey Ricken Soak, *c.* 60 km N of Bullfinch, Sep 1970, *Wilson 8768* (PERTH); North Bungulla, Sep 1926, *Gardner s.n.* (PERTH); 800 m NNE of summit of Mt Holland, 87.5 km ENE of Hyden, Aug 1990, *Mollemans 3338* (BRI, PERTH).

***Distribution and habitat*:** *Beyeria minor* is known from scattered localities near Southern Cross, Kellerberrin and Hyden in south-western Western Australia (**Map 20**). It grows in *Acacia* shrubland communities on red brown earths or deep sandy soils.

***Phenology*:** Flowers have been collected from August to October, fruits in October.

***Affinities*:** *Beyeria minor* is morphologically most similar to *B. calycina* and *B. disciformis*. It differs from the former by its smaller leaf blades (5–10 mm long × 1.6–2.5 mm wide compared with 15–35 mm long × 2–3 mm

wide) that are narrow-oblong to narrow-elliptic rather than linear in outline, and its smaller accrescent calyx lobes in female flowers (that are up to 3 mm long compared with up to 7 mm long). For features distinguishing *B. minor* from *B. disciformis*, refer to the 'Affinities' section under that species.

19. Beyeria physaphylla Halford & R.J.F.Hend. **species nova** strato viscido tenui in partibus maxime et ramulis glabris et longitudinaliter sulcatis *B. calycinae* Airy Shaw et *B. minori* (Airy Shaw) Halford & R.J.F.Hend. ut videtur maxime affinis sed ab utroque forma et amplitudine foliorum et apice laminae folii rotundato non apiculato et calycis lobis non accrescentibus post florescentiam distinguenda est. **Typus:** Western Australia. *c.* 5.5 km ESE of Scaddan, on Scaddan road to Bostock Swamp, 19 September 1988, *R.J.F.Henderson H3180* (holo: BRI; iso: K, MEL, PERTH, distribuendi).

Beyeria sp. Scaddan (P. van der Moezel PGV161), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Monoecious or dioecious, erect, much-branched **shrubs** to 0.5 m high, thinly resinous on most parts. Young branchlets light brown, ± terete, longitudinally sulcate, glabrous; older branchlets with grey tessellated bark. **Leaves** mostly crowded on short lateral branchlets, petiolate; petioles 0.5–1 mm long, glabrous; blades obovate, 2.8–4.5 mm long, 1.5–2.2 mm wide, length:width ratio 1.5–2:1; adaxial surface glabrous and ± smooth, resinous; abaxial surface densely hairy with ± sessile, stellate hairs up to 0.6 mm across; base cuneate; margins recurved to midrib concealing abaxial leaf surface; apex rounded; midvein obscure adaxially, abaxially raised, ± flattened, glabrous and resinous on abaxial face; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary, solitary; bracts oblong or obovate, 0.5–1.3 mm long, rounded at apex, glabrous; pedicels glabrous, stouter on female flowers than on male flowers; calyx lobes 5, suborbicular, glabrous, concave adaxially, gibbose abaxially, the margins erose, obtuse to rounded at apex; petals slightly shorter than or equal to calyx lobes, erect, glabrous abaxially, sparsely to moderately villose adaxially, the margins erose distally; disc obscure or absent. **Male flowers** with pedicels 2–4 mm long; calyx lobes 1–1.3 mm long, 1–1.1 mm wide, surrounding androecium at anthesis; petals suborbicular or depressed obovate, 0.5–0.6 mm long, 0.5–0.6 mm wide; receptacle 0.8–1 mm across, minutely hairy; stamens 9–11; filaments erect, 0.1–0.3 mm long, glabrous, bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with pedicels 3–4 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 0.9–1 mm long, 0.8–1.1 mm wide; petals marcescent, broad-oblong, 0.5–0.8 mm long, 0.5–0.8 mm wide; ovary subglobose, *c.* 0.5 mm long, glabrous, 3-locular; style *c.* 0.1 mm long, glabrous; stigma calyptriform, *c.* 0.9 mm across, glabrous except for minute scattered hairs on margin, with margins entire. **Fruits** ± ellipsoid, sometimes laterally compressed, 4–4.7 mm long, 3.2–4.7 mm across, 1- or 2-seeded, glabrous, ± smooth; persistent calyx *c.* one fifth the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 3.5 mm long (including caruncle), 2.5 mm across and 2.1 mm in thickness; testa mottled, light and dark brown; caruncle *c.* 0.8 mm long and 1.6 mm wide, light brown. **Fig. 7.**

***Additional specimens examined*: Western Australia.** *c.* 5.5 km WSW of Scaddan, on Scaddan road to Bostock Swamp, 19 Sep 1988, *Henderson H3179* (BRI); 10 km E of Scaddan on Scaddan road, Aug 1982, *van der Moezel PGV161* (PERTH).

***Distribution and habitat*:** *Beyeria physaphylla* is known only from near Scaddan, south-western Western Australia (**Map 21**). It grows in mallee eucalypt woodland with a shrubby layer of *Melaleuca* spp., *Hakea* spp. and *Leptospermum* sp., on grey sandy soil on the edge of a salt lake.

***Phenology*:** Flowers and fruits have been collected in September.

***Affinities*:** *Beyeria physaphylla* is most similar to *B. calycina* and *B. minor* in having a thin viscid covering over most parts and branchlets that are glabrous and longitudinally sulcate. *Beyeria physaphylla* can be distinguished from both these species by its leaf blade shape and size, its lack of an apiculum at the leaf apex, and in its calyx

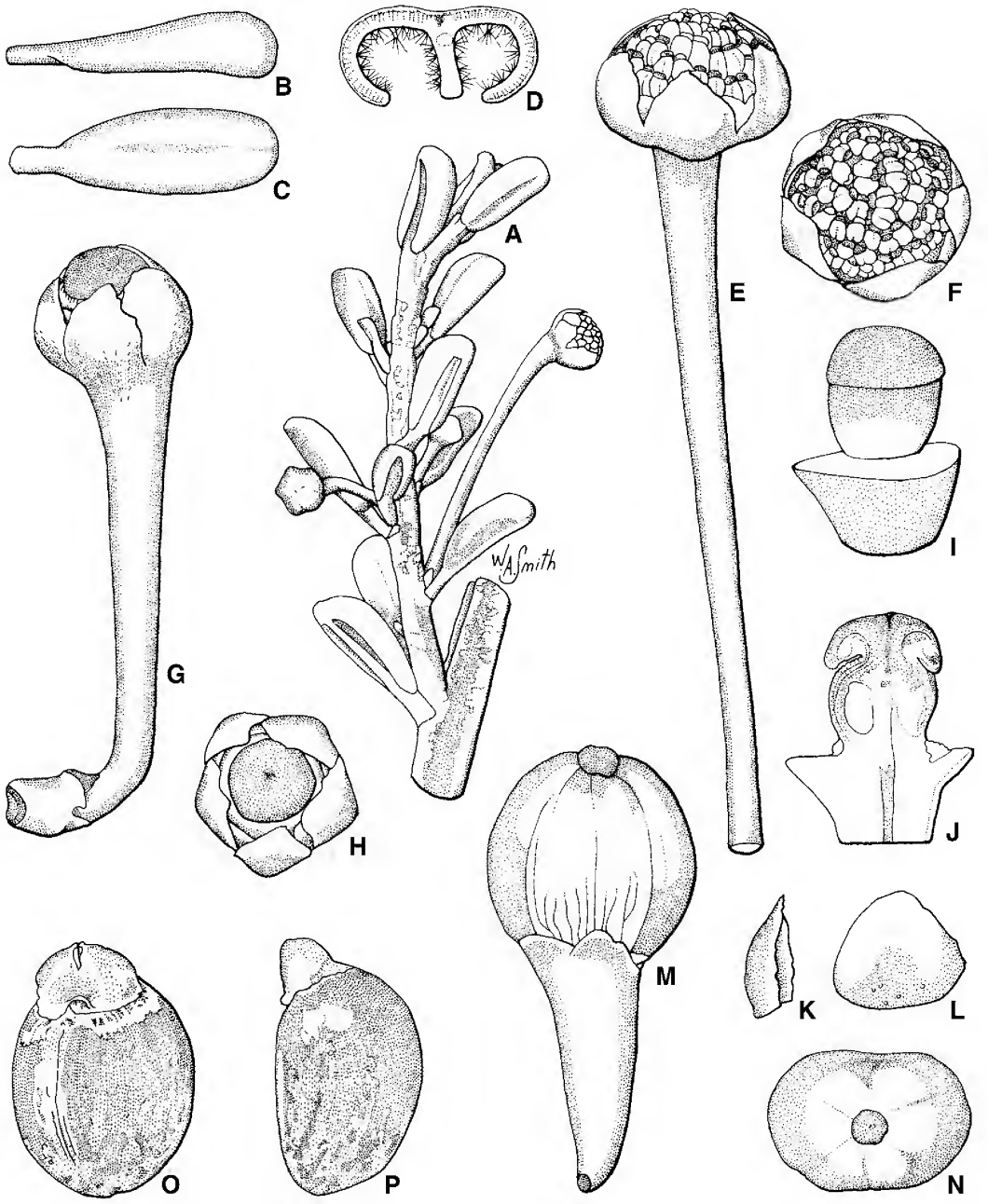

Fig. 7. ***Beyeria physaphylla***. A. branchlet with male flowers × 4. B. side view of leaf × 6. C. adaxial view of leaf × 6. D. transverse section of leaf × 12. E. side view of male flower × 12. F. face view of male flower × 12. G. side view of female flower × 12. H. face view of female flower × 12. I. side view of ovary and style on receptacle × 15. J. transverse section of stigma and ovary × 15. K. side view of calyx lobe from female flower × 15. L. abaxial view of calyx lobe from female flower × 15. M. side view of fruit × 6. N. face view of fruit × 6. O. abaxial view of seed × 10. P. side view of seed × 10. A–P from *Henderson H3180* (BRI). Del. W.Smith.

Table 5. Comparison of morphological characters for *Beyeria calycina*, *B. minor* and *B. physaphylla*

Character	*B. calycina*	*B. minor*	*B. physaphylla*
leaf shape	linear	narrow-oblong to narrow-elliptic	obovate
leaf dimensions (mm)	15–35 × 2–3	5–10 × 1.6–2.5	3–4.5 × 1.6–2.2
leaf apex	apiculate	apiculate	rounded
calyx lobes after flowering	accrescent	accrescent	not enlarging

lobes which do not enlarge as the fruit matures. These differences are summarized in **Table 5**.

***Etymology*:** The specific epithet is from Greek, *physao*, puff up, distend, inflate, and *-phyllus*, -leaved, and refers to the inflated appearance of the leaf blades of this species.

20. Beyeria rostellata Halford & R.J.F.Hend. **species nova** *B. disciformi* Halford & R.J.F.Hend. et *B. minori* (Airy Shaw) Halford & R.J.F.Hend. ut videtur maxime affinis sed ab utroque sed foliorum petiolo longiore (1.5–2 mm longo non 0.5–1 mm longo ut in *B. disciformi* vel 0.6–1.2 mm longo ut in *B. minore*), stylo in floribus femineis longiore (*c.* 0.6 mm longo non *c.* 0.1 mm longo ut in *B. disciformi* et *B. minore*), pilis stellatis in pagina abaxiali laminae folii minoribus (0.05 mm diam. non 0.6 mm diam. ut in *B. disciformi* et *B. minore*), calycis lobis lato-oblongis, oblongis vel angusto-ovatis non suborbicularis vel latissime ovatis et apice laminae folii rotundato non obtuso et apiculato valido differt. A *B. minore* lamina folii angusto-oblonga usque ad lineari non oblonga usque ad oblongo-elliptica et calycis lobis non accrescentibus nec non differt. **Typus:** Western Australia. [precise locality withheld] Jackson Range, 7 September 2006, *D.Halford Q9143 & G.Cockerton* (holo: PERTH; iso: BRI, MEL, MO).

Beyeria sp. Jackson Range (R. Cranfield & P. Spencer 7751), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Monoecious, erect, **shrubs** to 1.8 m high, resinous on most parts, thickly so on young shoots and adaxial leaf surface. Young branchlets of unknown colour when fresh state, ± terete, longitudinally sulcate, glabrous; older branchlets with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 1.5–2 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades narrow-oblong to linear, 13–20 mm long, 1.2–2.3 mm wide, length: width ratio 5–9:1; adaxial surface glabrous and minutely papillose (usually obscured by resinous covering); abaxial surface densely hairy with sessile, stellate hairs up to 0.5 mm across; base cuneate or obtuse; margins recurved usually to midrib concealing abaxial leaf surface; apex rounded, ultimately terminated by sessile gland; midvein impressed adaxially, abaxially prominently raised, ± flattened and glabrous on abaxial face; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary, solitary; bracts oblong, *c.* 1.1 mm long, rounded at apex, glabrous; pedicels ± glabrous except for minute erect glandular hairs proximally, slightly stouter and longer on female flowers than on male flowers; calyx lobes 5, green, glabrous, slightly concavo-convex, the margins ± entire, rounded at apex; petals slightly shorter than or equal to calyx lobes, erect, glabrous abaxially, densely villose adaxially proximally, the margins erose; disc of 5 discrete glands; glands fleshy, *c.* 0.2 mm long, laterally compressed, glabrous. **Male flowers** with pedicels 3–5 mm long; calyx lobes broad-oblong, 1.3–1.5 mm long, 0.8–1 mm wide, surrounding androecium at anthesis; petals depressed obovate, *c.* 1.4 mm long and 1.6 mm wide; disc glands truncate or irregularly lobed distally; receptacle 0.9–1.1 mm across, minutely hairy; stamens 25;

filaments erect, 0.3–0.5 mm long, glabrous, entire; anthers 0.4–0.5 mm long. **Female flowers** with pedicels 5–7 mm long; calyx lobes ± appressed and enclosing gynoecium apart from stigma, oblong or narrow-ovate, *c.* 2.3 mm long and 1.3 mm wide; petals caducous, obovate, *c.* 1.4 mm long and 0.9 mm wide; disc glands entire, rounded; ovary subglobose, 0.9–1.1 mm long, glabrous, 3-locular; style *c.* 0.6 mm long, glabrous; stigma discoid, *c.* 0.7 mm across, glabrous, with margins ± entire. **Fruits** ellipsoid, 5–5.5 mm long, 3.5–4 mm across, 2- or 3-seeded, glabrous, ± smooth; persistent calyx *c.* one third the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, 4.5–6.0 mm long (including caruncle), 2.5–2.6 mm across, 1.8–2.1 mm in thickness; testa dark brown; caruncle *c.* 0.7 mm long and 1.2 mm wide, light brown. **Fig. 8.**

***Additional selected specimens examined*: Western Australia.** [precise localities withheld for conservation purposes] May 1978, *Keighery* 1640 (PERTH); Jul 1990, *Mollemans & Mollemans 3101* (BRI, CANB); Nov 1996, *Sweedman 4365* (PERTH); Sep 1989, *Cranfield & Spencer 7751* (PERTH); Nov 2000, *Carlino 174.TC20* (PERTH); Oct 2003, *Cockerton 9106* (BRI); Nov 2000, *Mattiske 175-2/249* (PERTH); Nov 2000, *Mattiske 193-2/586* (PERTH); Aug 2002, *Bull s.n.* (PERTH); Oct 2000, *Mattiske J39-149* (PERTH); Sep 1981, *Newbey 9024* (PERTH).

***Distribution and habitat*:** *Beyeria rostellata* is known only from the slopes and summit of Mt Jackson Range, south-western Western Australia (**Map 22**). It grows in *Acacia* and *Eucalyptus* tall shrubland or low open woodland on skeletal red sandy to clay soils over banded ironstone substrates.

***Phenology*:** Flowers have been collected in May, July and September, fruits in July, September and December.

***Affinities*:** *Beyeria rostellata* is most similar to *B. disciformis* and *B. minor*. The differences are summarized in **Table 6**.

Table 6. Comparison of morphological characters for *Beyeria rostellata*, *B. disciformis* and *B. minor*

Character	*B. rostellata*	*B. disciformis*	*B. minor*
petiole length (mm)	1.5–2	0.5–1	0.6–1.2
leaf shape	narrow-oblong to linear	oblong to oblong-elliptic	narrow-oblong to narrow-elliptic
leaf length (mm)	13–20	10–16	5–10
leaf apex	rounded, without stout apiculum	rounded or obtuse, with stout apiculum	rounded or obtuse, with stout apiculum
calyx lobes shape	broad-oblong, oblong, narrow ovate	suborbicular to very broad-ovate	suborbicular to very broad-ovate
calyx lobes after flowering	not enlarging	accrescent	accrescent
style length (mm)	*c.* 0.6	*c.* 0.1	*c.* 0.1

***Notes*:** *Beyeria rostellata* is listed as Priority One under DEC Conservation Codes for Western Australian Flora, under the name *Beyeria* sp. Jackson Range (R. Cranfield & P. Spencer 7751) (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

***Etymology*:** The specific epithet is from Latin *rostellatus*, provided with a short beak, and refers to the prominent persistent style on the fruit of this species.

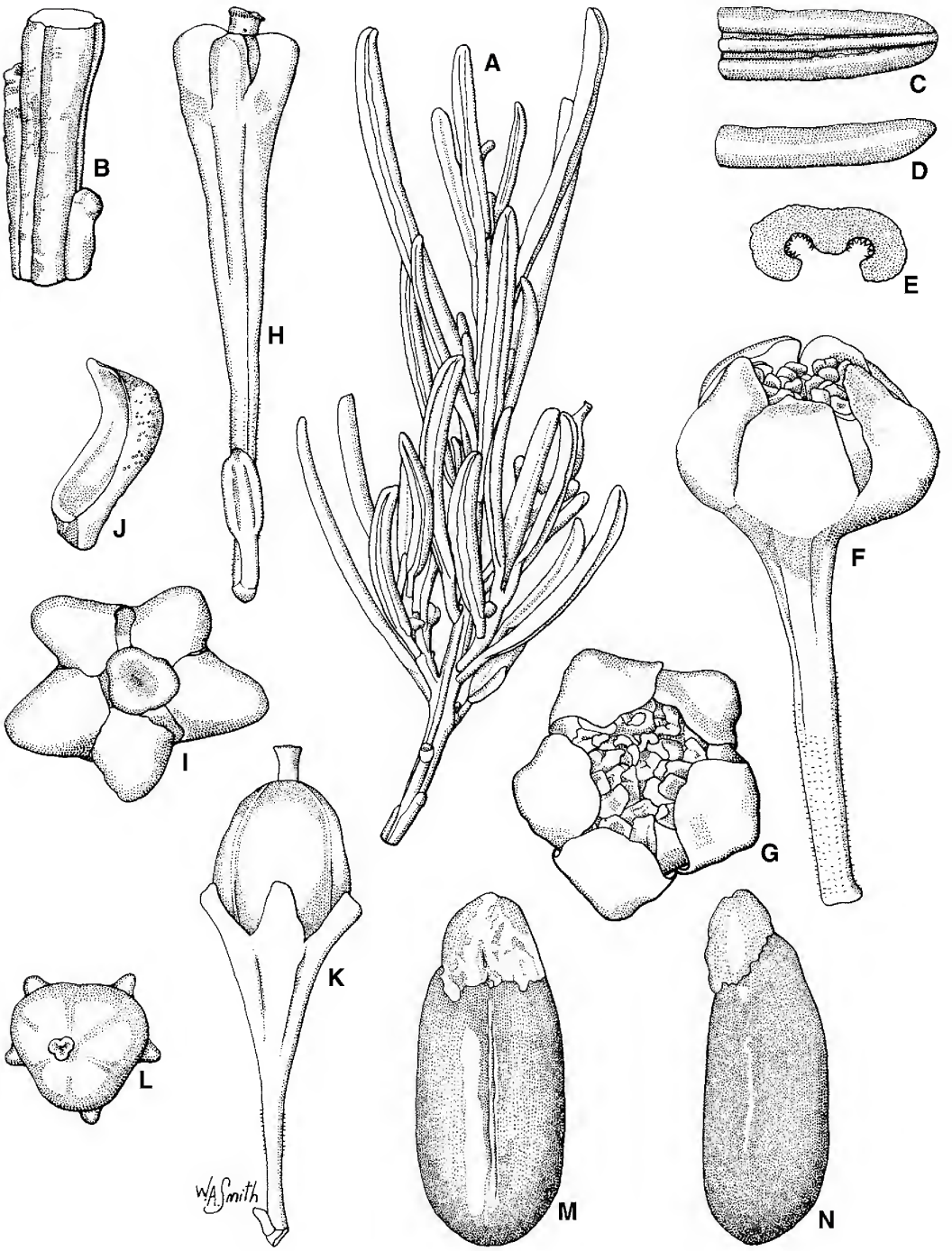

Fig. 8. ***Beyeria rostellata***. A. branchlet with fruit × 2. B. branchlet showing longitudinal grooves × 8. C. abaxial view of leaf apex × 6. D. side view of leaf apex × 6. E. transverse section of leaf × 12. F. side view of male flower × 12. G. face view of male flower × 12. H. side view of female flower × 6. I. face view of female flower × 12. J. side view of calyx lobe from female flower × 12. K. side view of fruit × 4. L. face view of fruit × 4. M. abaxial view of seed × 8. N. side view of seed × 8. A–N from *Halford & Cockerton Q9143* (BRI). Del. W.Smith.

21. Beyeria similis (Müll.Arg.) Benth., *Fl. Austral.* 6: 67 (1873); *Beyeriopsis similis* Müll. Arg., *Linnaea* 34: 58 (1865). **Type:** [Western Australia.] Swan River, [1852,] *J.Drummond ser. 6 no. 86* (holo: G-DC *n.v.* [microfiche IDC 800-73, 2454: II. 4]; iso: MEL [3 sheets 114226, 114227, 114228], PERTH, K).

Monoecious, erect, much-branched **shrubs** to 0.3 m high, resinous on most parts. Young branchlets of unknown colour, angular becoming terete with age, glabrous; older branchlets with grey to black shallowly fissured bark. **Leaves** ± sessile; blades linear, 20–35 (–50) mm long, 0.8–1.5 mm wide, length:width ratio 25–34:1; adaxial surface glabrous, tuberculate with yellow resinous dots or rarely smooth; abaxial surface hairy with ± sessile, stellate hairs *c.* 0.05 mm across; base cuneate; margins revolute usually to midrib concealing abaxial leaf surface; apex obtuse to rounded, recurved; midvein obscure adaxially, abaxially raised, ± flattened, glabrous and resinous; secondary and tertiary veins obscure; marginal glands absent. **Flowers** pedicellate, axillary, solitary or fasciculate in 2–4-flowered fascicles; bracts ± oblong, 0.5–0.7 mm long, acute at apex, glabrous; pedicels ± glabrous except for scattered minute erect simple hairs proximally, stouter and longer on female flowers than on male flowers; calyx lobes 5, of unknown colour when fresh, suborbicular, glabrous, concave adaxially, gibbose abaxially, the margins ± entire, rounded at apex; petals slightly shorter than or equal to calyx lobes, erect, suborbicular, glabrous abaxially, the margins entire; disc of 5 discrete glands in male flowers, obscure or absent in female flowers. **Male flowers** with pedicels 2–3 mm long; calyx lobes 0.9–1.4 mm long, 0.8–1.8 mm wide, surrounding androecium at anthesis; petals 0.7–0.9 mm long, 0.8–1.2 mm wide; sparsely hairy adaxially proximally; disc glands thin, triangular, < 0.2 mm long, dorsi-ventrally compressed, glabrous, acute; receptacle *c.* 0.9 mm across, glabrous; stamens 15; filaments erect, 0.4–0.6 mm long, glabrous, bifid distally; anthers *c.* 0.2 mm long. **Female flowers** with pedicels 5–10 mm long; calyx lobes ± appressed to and enclosing gynoecium apart from stigma, 0.7–1 mm long, 1.2–1.7 mm wide; petals marcescent, 0.4–0.7 mm long, 0.4–0.6 mm wide, glabrous abaxially; ovary ellipsoid, *c.* 1 mm long, glabrous, 2- or 3-locular, with 4 or 6 short subapical appendages; style ± obsolete; stigma calyptriform, *c.* 0.4 mm across, glabrous, with margins entire. **Fruits** subellipsoid, 3–6 mm long (excluding horns), 4–5.5 mm across, with 2 small horn-like subapical appendages, 1-seeded, glabrous, ± smooth; persistent calyx *c.* one fifth the length of mature fruit; subapical appendages up to 2 mm long. **Seeds** ellipsoid, 4.3–4.7 mm long (including caruncle), 3–3.5 mm across, 3–3.5 mm in thickness; testa light to dark brown; caruncle 0.5–0.8 mm long, 1–1.8 mm wide, creamy-white.

***Additional specimens examined*: Western Australia.** [precise localities withheld for conservation purposes], Oct 1974, *George 12908* (BRI); Mt Peron, Aug 1949, *Gardner 9410* (PERTH); Aug 1979, *Griffin 2003* (PERTH); Sep 1976, *Johnson 3299* (BRI); Sep 1976, *Briggs 6371* (NSW).

***Distribution and habitat*:** *Beyeria similis* is confined to the Mt Lesueur area north-east of Jurien Bay, Western Australia (**Map 23**). It grows in shrubland communities on sandstone ridges, and in heath communities with low eucalypts on sandy clay soils in valleys and on shallow grey sand among massive lateritic duricrust boulders.

***Phenology*:** Flowers and fruits have been collected in August and September.

***Affinities*:** *Beyeria similis* is morphologically most similar to *B. gardneri*. For distinguishing characters refer to the 'Affinities' section under *B. gardneri*.

***Notes*:** *Beyeria similis* is listed as Priority Three under DEC Conservation Codes for Western Australian Flora (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

22. Beyeria simplex Halford & R.J.F.Hend. **species nova** *B. latifoliae* (Müll.Arg.) Baill. et *B. lepidopetalae* Müll.Arg. ut videtur maxime affinis sed ab utroque ramulis et petiolis indumento pilorum simplicium non stellatorum et ovariis glabris distinguenda est. A *B. latifolia* lamina folii angusto-oblonga vel angustissimo-ovata non ovata ad late ovata et pedicellis et pagina adaxiali loborum calycis glabra non pilifera nec non differt. A *B. lepidopetala* pedicellis brevioribus (2–4 mm longis non 8–30 mm longis) nec non differt. **Typus:** Western Australia. Cape Arid National Park, at foot of Mt Ragged, 5 December 1971, *R.D.Royce 10111* (holo: PERTH; iso: CANB).

Beyeria sp. B Mount Ragged (A.S.George 7422), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Monoecious **shrubs** to *c.* 0.3 m high, not resinous. Young branchlets ± terete, moderately to densely hairy, glabrescent with age; hairs simple, ascending to spreading, 0.4–0.9 mm long; older branchlets with grey shallowly fissured bark. **Leaves** petiolate; petioles 1–2 mm long, moderately hairy with hairs as for young branchlets; blades narrow-oblong or very narrow-ovate, 7–17 mm long, 1.7–3.5 mm wide, length:width ratio 4–5:1; adaxial surface glabrous and ± smooth; abaxial surface densely hairy with ± sessile, stellate hairs *c.* 0.4 mm across; base obtuse; margins revolute usually to midrib concealing abaxial leaf surface; apex rounded; midvein slightly impressed adaxially, abaxially raised, moderately hairy with simple hairs up to 0.4 mm long; secondary and tertiary veins obscure; marginal glands usually present on blade, up to 1 mm from base, 1 per side of midrib, ± sessile, smooth, *c.* 0.1 mm across. **Flowers** pedicellate, axillary, solitary; bracts oblong, 0.1–0.8 mm long, obtuse or rounded at apex, ± glabrous; pedicels 2–4 mm long, glabrous, stouter on female flowers than on male flowers; calyx lobes 5, of unknown colour when fresh, suborbicular, glabrous, concave adaxially, gibbose abaxially, the margins erose, obtuse to rounded at apex; petals slightly shorter than calyx lobes, erect, transverse-elliptic, glabrous abaxially, densely villose adaxially, the margins erose distally; disc of 5 discrete glands; glands fleshy, 0.4–0.5 mm long, laterally compressed, glabrous, truncate. **Male flowers** with calyx lobes *c.* 1.4 mm long and 1.5 mm wide, surrounding androecium at anthesis; petals 0.9–1 mm long, 1.6–1.8 mm wide; receptacle *c.* 1.8 mm across, glabrous; stamens 20–25; filaments erect, 0.3–0.6 mm long, glabrous, bifid distally; anthers 0.3–0.5 mm long. **Female flowers** with calyx lobes ± appressed to and enclosing gynoecium apart from stigma, *c.* 1.4 mm long, and 1.3 mm wide; petals marcescent, *c.* 0.8 mm long, 0.9–1 mm wide; ovary broad-ovoid, laterally compressed, *c.* 1.2 mm long, glabrous, 2-locular; style 0.1–0.2 mm long, glabrous; stigma calyptriform, *c.* 0.3 mm across, shallowly umbilicate, glabrous, with margins ± entire. **Fruits** ± ovoid, laterally compressed, *c.* 6 mm long, 5.3 mm across and 3.6 mm in thickness, 1- or 2-seeded, glabrous, smooth; persistent calyx *c.* one fifth the length of mature fruit. **Seeds** ellipsoid, dorsi-ventrally compressed, *c.* 5.2 mm long (including caruncle), 3.4 mm across and 2.8 mm in thickness; testa light brown; caruncle *c.* 0.6 mm long and 1 mm wide, light brown. **Fig. 9.**

***Additional specimens examined*: Western Australia**. Mt Ragged, Jan 1966, *George 7422* (BRI, PERTH); *ibid*, Apr 1996, *Barrett 670* (PERTH); lower western slopes of Mt Ragged, Dec 1999, *Hislop 1956B* (PERTH); western slopes of Mt Ragged, Cape Arid, Mar 1987, *Keighery & Alford 1503* (PERTH).

***Distribution and habitat*:** *Beyeria simplex* occurs on the south coast of Western Australia where it is known from Mt Ragged in Cape Arid National Park (**Map 24**). It grows in mallee heath on mountain slopes in stony sandy soil and in gullies on rocky slopes.

***Phenology*:** Flowers and fruits have been collected in September, October, December and March.

***Affinities*:** *Beyeria simplex* is most similar to *B. latifolia* and *B. lepidopetala* but differs from both of these species in having an indumentum of simple rather than stellate hairs on the branchlets and petioles, and a glabrous ovary. *Beyeria simplex* further differs from *B. latifolia* in having narrow-oblong or very narrow-ovate rather than ovate to broad-ovate leaves, glabrous rather than hairy pedicels, and calyx lobes that are

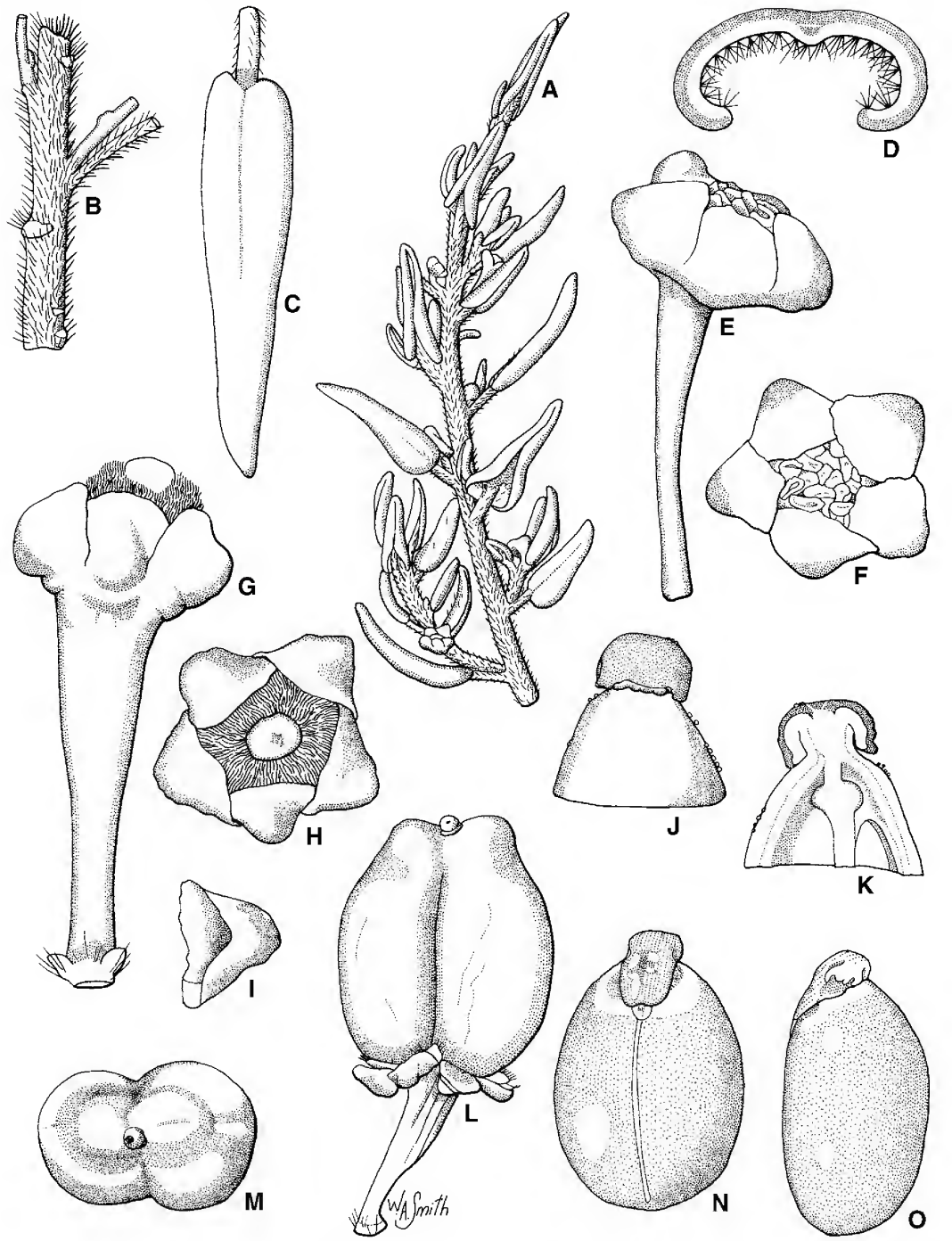

Fig. 9. ***Beyeria simplex***. A. branchlet with flowers × 2. B. branchlet showing indumentum × 8. C. adaxial view of leaf × 4. D. transverse section of leaf × 12. E. side view of male flower × 12. F. face view of male flower × 12. G. side view of female flower × 12. H. face view of female flower × 12. I. side view of calyx lobe from female flower × 12. J. Stigma × 24. K. transverse section of stigma and distal half of ovary × 24. L. side view of fruit × 6. M. face view of fruit × 6. N. abaxial view of seed × 8. O. side view of seed × 8. A from *George 7422* (BRI), B–O from *Royce 10111* (PERTH). Del. W.Smith.

glabrous on the adaxial surface rather than hairy. *Beyeria simplex* also differs from *B. lepidopetala* in having shorter pedicels which are 2–4 mm long compared with 8–30 mm long as in that species.

***Etymology*:** The specific epithet is from Latin *simplex*, simple, undivided or unbranched, and refers to the simple hairs on the branchlets of this species.

23. Beyeria sulcata Halford & R.J.F.Hend. **species nova** *B. brevifoliae* (Müll.Arg.) Benth. affinis sed foliis costa excurrenti ad apicem, pedicellis robustioribus et generatim brevioribus (1–9 mm longis non 5–15 mm longis), ramulis plerumque sulcatis, foliis sessilibus vel petiolis usque ad 0.5 mm longis non petiolis semper 1–2 mm longis et surculis immaturis viscidis differt. *Beyeria sulcata* cum *B. lechenaultii* (DC.) Baill. antea confusa sed floribus ambo maribus et femineis petalis, calycis lobis florum marium plus minusve erectis et androecium sub anthesi cingentibus facile distinguenda. **Typus:** Western Australia. *c.* 13 km NE of Bruce Rock on road to Merredin, 16 September 1988, *R.J.F.Henderson H3161* (holo: BRI; iso: K, MEL, PERTH, distribuendi).

Monoecious, erect to spreading **shrubs** to 2 m high, usually resinous on most parts. Young branchlets of unknown colour when fresh, ± angular, mostly longitudinally grooved, glabrous; older branchlets with grey to black flaking or shallowly fissured bark. **Leaves** sessile or shortly petiolate; petioles up to 1.7 mm long, glabrous, minutely papillose (usually obscured by resinous covering); blades narrow-obovate or linear, 7–35 mm long, 0.8–2.2 mm wide, length:width ratio 8–35:1; adaxial surface glabrous, minutely papillose (usually obscured by resinous covering); abaxial surface glabrous and papillose or densely hairy with sessile, stellate hairs up to 0.3 mm across; base cuneate to attenuate; margins recurved usually to midrib concealing abaxial leaf surface; apex rounded, obtuse, acute to attenuate or truncate, ultimately apiculate with extension from midrib; apiculum stout, up to 0.3 mm long, bent upward; midvein slightly raised adaxially, abaxially prominently raised, ± flattened and glabrous; secondary and tertiary veins obscure; marginal glands absent or present on blade, up to 10 mm from base, 1 or 2 per side, sessile, smooth, up to 0.2 mm across. **Flowers** pedicellate, axillary, solitary or fasciculate in 2- or 3-flowered fascicles; bracts ovate, 0.3–0.7 mm long, acute to obtuse at apex, glabrous; pedicels glabrous, slightly stouter on female flowers than on male flowers; calyx 5, of unknown colour when fresh, concavo-convex, glabrous, the margins entire or erose, marginal glands usually present, rounded to truncate at apex; petals slightly shorter than or equal to calyx, suborbicular, erect, the margins erose; disc in male flowers of 5 discrete glands, female flowers absent or obscure. **Male flowers** with pedicels 0.8–3.5 mm long; calyx lobes broad-obovate or broad-oblong, 0.8–1 mm long, 0.6–0.9 mm wide, surrounding androecium at anthesis; petals 0.6–1 mm long, 0.5–1 mm wide, glabrous abaxially, sparsely villose adaxially proximally; disc glands fleshy, filiform, up to 0.2 mm long, glabrous; receptacle *c.* 0.9 mm across, sparsely stellate hairy; stamens 7–11; filaments erect, 0.1–0.3 mm long, glabrous, shortly bifid distally; anthers 0.3–0.4 mm long. **Female flowers** with pedicels 0.7–7.5 mm long; calyx lobes ± appressed and enclosing gynoecium apart from stigma, broad-oblong or broad-obovate, 0.8–1.3 mm long, 0.4–0.9 mm wide; petals marcescent, 0.5–0.8 mm long, 0.4–0.7 mm wide, glabrous; ovary ovoid and laterally compressed or subglobose, 0.8–1.3 mm long, glabrous, 2- or 3-locular; style ± obsolete; stigma calyptriform, 0.5–0.7 mm across, sulcate adaxially, glabrous, with margins entire. **Fruits** obloid or broad-ovoid, 2.7–4.7 mm long, 2.4–3.8 mm across, 2- or 3-seeded, glabrous, ± smooth; persistent calyx up to one third the length of mature fruit. **Seeds** obloid or ellipsoid, dorsi-ventrally compressed, 2.7–4.2 mm long (including caruncle), 1.6–2.2 mm across, 1.5–2 mm in thickness; testa dark brown; caruncle 0.9–1 mm long, *c.* 0.8 mm wide, light brown.

***Distribution*:** *Beyeria sulcata* is endemic to south-western Western Australia.

***Affinities*:** *Beyeria sulcata* is similar to *B. brevifolia* but differs in having leaves with the midrib excurrent at the apex, pedicels which are more robust and generally shorter (1–9 mm long compared with 5–15 mm long),

mostly sulcate branchlets, leaves which are sessile or with a petiole up to 0.5 mm long (compared with leaves with petioles 1–2 mm long), and its generally viscid young shoots compared with non-viscid shoots.

Beyeria sulcata has in the past been confused with *B. lechenaultii* (DC.) Baill. but is easily distinguished in having petals in both male and female flowers and with the calyx lobes of male flowers more or less erect and surrounding the androecium at anthesis.

***Etymology*:** The specific epithet is from Latin *sulcatus*, furrowed or grooved, and refers to the longitudinal grooves on the branchlets of this species.

***Notes*:** *Beyeria sulcata* exhibits some discontinuous variation in minor leaf and stem characters with little geographical discontinuity. This variation is considered sufficient to warrant formal recognition of four varieties within this species which can be distinguished using the following key.

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1 Leaf apices with a truncate apiculum . . . . . **23d. B. sulcata** var. **truncata**
1. Leaf apices with an acute apiculum 2

2 Young branchlets not distinctly grooved; pedicels 2–9 mm long; leaf apices acute to attenuate . . . . . **23c. B. sulcata** var. **gracilis**
2. Young branchlets distinctly longitudinally grooved; pedicels 1–4 mm long; leaf apices rounded to obtuse 3

3 Leaf blades linear, 0.8–1.1 mm wide . . . . . **23b. B. sulcata** var. **brevipes**
3. Leaf blades narrow-obovate, 1.3–2.5 mm wide . . . . . **23a. B. sulcata** var. **sulcata**

23a. Beyeria sulcata Halford & R.J.F.Hend. var. **sulcata**

Beyeria brevifolia var. *robustior* Airy Shaw, *Kew Bull.* 26: 69 (1971). **Type:** Western Australia. Merredin, 28 November 1923, *M.Koch R2996* (holo: K [2 sheets]; ?iso: PERTH; MEL [3 sheets]; NSW).

Bark on lower stems ± smooth, shiny, bronze-coloured, with peeling, reddish coloured papery strips. Young branchlets distinctly longitudinally grooved. **Leaves** sessile or with petioles up to 0.7 mm long; blades narrow-obovate, 7–16 (–23) mm long, 1.3–2.5 mm wide, apex rounded or obtuse, ultimately apiculate with extension from midrib; apiculum stout, up to 0.2 mm long. **Male flowers** with pedicels 1.2–1.7 mm long. **Female flowers** with pedicels 0.7–1.5 (–3) mm long; ovary 2- or 3-locular. **Fig. 10 & 11a–d.**

***Additional selected specimens examined*: Western Australia.** Bronti [Brontie], Aug 1953, *Gardner 12186* (PERTH); along State Vermin Fence No. 7, 60 km NNW of Southern Cross, Nov 1985, *Dodd 222* (CANB, PERTH); Coolgardie, Oct 1934, *Gardner s.n.* (PERTH); Calooli, 9 miles [*c.* 14 km] SW of Coolgardie, Jul 1925, *Franks s.n.* (PERTH); Queen Victoria Springs N.R. study area, Jun 1987, *Pearson 229* (PERTH); Queen Victoria Spring, N of Zanthus, Oct 1956, *Royce 5523* (PERTH); between Cundeelee and Queen Victoria Spring, Oct 1956, *Royce 5516* (PERTH); 12 miles [*c.* 19 km] S of Queen Victoria Spring, Jan 1956, *Royce 5327* (PERTH); near Campion, Aug 1945, *Gardner s.n.* (PERTH); Campion, Sep 1945, *Gardner 7635* (PERTH); Booraan [Booran], Aug 1950, *Gardner 9540* (MEL, PERTH); Southern Cross, Aug 1974, *Wittwer 1291* (PERTH); 13 km E of Southern Cross, Mar 1966, *Wilson 4038* (PERTH); 11 miles [*c.* 18 km] E of Southern Cross, Oct 1963, *Jefferies 631006* (PERTH); Karalee, Mar 1957, *Jefferies 573074* (PERTH); *c.* 27 km ESE of Southern Cross, on road to Coolgardie, Sep 1988, *Henderson H3162* (BRI); 13 km NE of Mt Hampton, *c.* 50 km SSW of Southern Cross, Sep 1979, *Newbey 5849* (PERTH); 28 miles [*c.* 45 km] S of Coolgardie, on Norseman road, Sep 1965, *Beauglehole ACB13305* (NSW, PERTH); 11 miles [*c.* 18 km] from Lake Grace on Ravensthorpe road, Oct 1965, *Knox 65XO22* (PERTH); No. 1 Rabbit Proof Fence, *c.* 32 km E of Lake King Township, Aug 1968, *Wilson 6969* (PERTH).

***Distribution and habitat*:** *Beyeria sulcata* var. *sulcata* occurs in southern Western Australia in an area more or less bounded by Kularin in the west, eastward to Queen Victoria Spring on the southern edge of the Great Victoria Desert and southwards to Frank Hann National Park and Lake Grace (**Map 25**). It grows in open woodland or hummock grassland communities on mostly sandy soils.

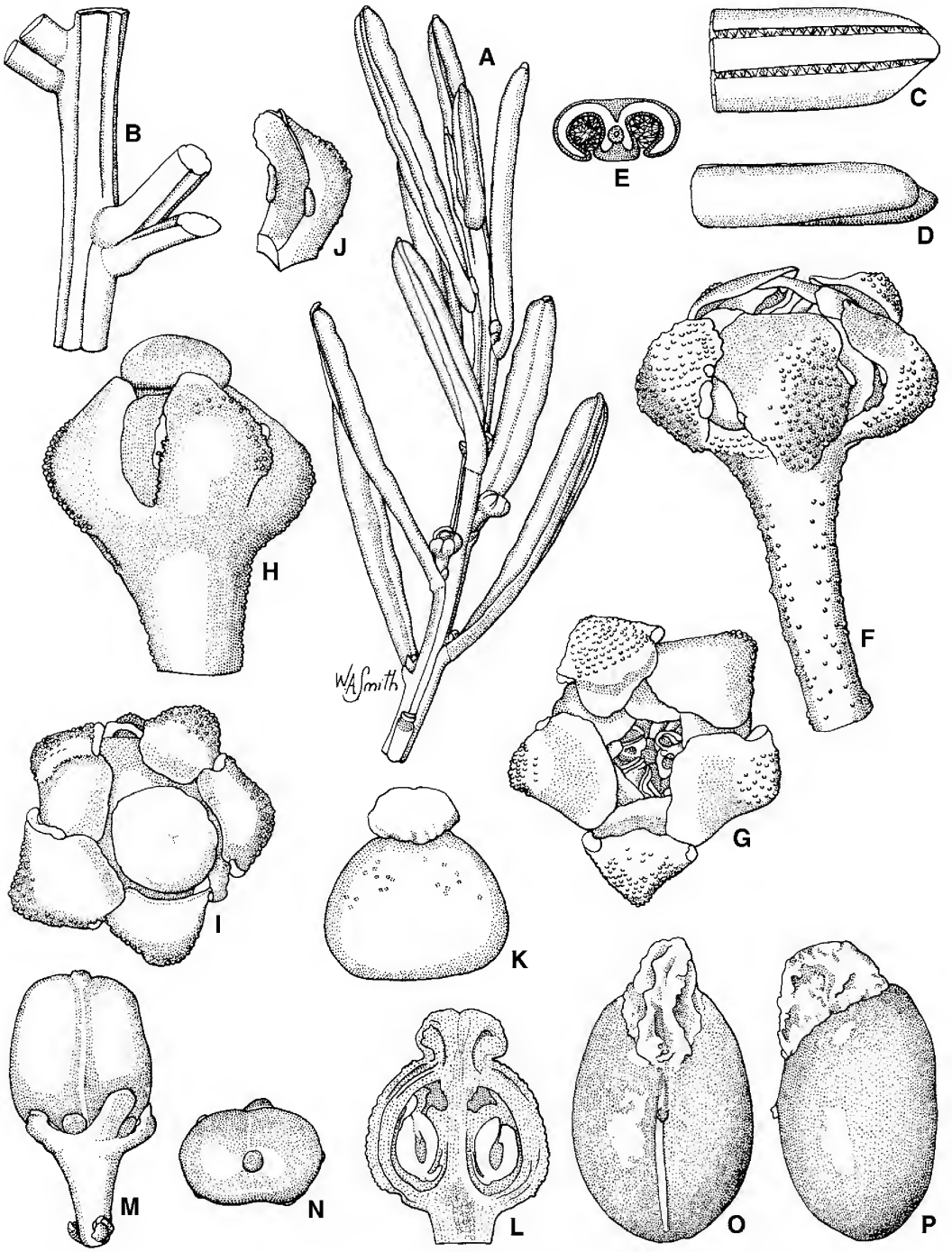

Fig. 10. ***Beyeria sulcata*** **var.** ***sulcata***. A. branchlet with flowers × 3. B. branchlet showing longitudinal grooves × 6. C. abaxial view of leaf apex × 12. D. side view of leaf apex × 12. E. transverse section of leaf × 12. F. side view of male flower × 24. G. face view of male flower × 24. H. side view of female flower × 24. I. face view of female flower × 24. J. side view of calyx lobe from female flower × 24. K. side view of ovary and style × 24. L. transverse section of stigma and ovary × 24. M. side view of fruit × 6. N. face view of fruit × 6. O. abaxial view of seed × 12. P. side view of seed × 12. A–P from *Henderson H3161* (BRI). Del. W.Smith.

***Phenology*:** Flowers have been collected throughout the year, particularly from August to November, fruits in February, March and from June to November.

23b. Beyeria sulcata var. **brevipes** (Airy Shaw) Halford & R.J.F.Hend. **combinatio nova**

Basionym: *Beyeria brevifolia* var. *brevipes* Airy Shaw, *Kew Bull.* 26: 69 (1971). **Type:** Western Australia. 370 mile peg, Coolgardie – Norseman road, May 1964, *P.R.Jefferies 640515* (holo: K; iso: PERTH).

Bark on lower stems unknown. Young branchlets longitudinally grooved. **Leaves** sessile or with petioles up to 0.7 mm long; blades linear, 15–22 mm long, 0.8–1.1 mm wide, apex rounded or obtuse, ultimately apiculate with extension from midrib; apiculum stout, up to 0.3 mm long. **Male flowers** with pedicels 1–3 mm long. **Female flowers** with pedicels 1.5–4 mm long; ovary 2- or 3-locular. **Fig. 11e–h.**

***Additional selected specimens examined*: Western Australia.** *c.* 44 km SE of Coolgardie, on road to Norseman, Sep 1988, *Henderson H3171* (BRI); 27 miles [*c.* 43 km] southward from Coolgardie, Mar 1953, *Gardner 11141* (PERTH); N of Norseman, *White s.n.* (PERTH); *ibid, s.dat.*, *White 611008* (PERTH); just north of Norseman, Mar 1957, *Jefferies 573059* (PERTH); 34 km E of Sinclair Soak, *c.* 93 km NE of Norseman, Aug 1980, *Newbey 7083* (PERTH); North Ironcap, May 1978, *Keighery 1676* (PERTH); near south end of Lake Cowan, *c.* 5 km N of Norseman, Jul 1967, *Wilson 6052* (PERTH); *c.* 30 km SSW of Norseman, on road to Salmon Gums, Sep 1988, *Henderson H3174* (BRI); *c.* 40 km SSE of Norseman, on road to Salmon Gums, Aug 1988, *Henderson H3176* (BRI).

***Distribution and habitat*:** *Beyeria sulcata* var. *brevipes* is known from south-western Western Australia in an area more or less bounded by Southern Cross, Coolgardie and Salmon Gums (**Map 26**). It is recorded as growing on well-drained sandy soils sometimes with gravel in mallee communities.

***Phenology*:** Flowers have been collected in March, May and from July to November, fruits in May, July and from September to November.

***Affinities*:** *Beyeria sulcata* var. *brevipes* differs from *B. sulcata* var. *sulcata* by its generally narrower and linear leaf blades.

23c. Beyeria sulcata var. **gracilis** Halford & R.J.F.Hend. **varietas nova** foliorum lamina acuta usque attenuata apiculo usque ad 0.2 mm longum, petiolis et pedicellis plerumque longioribus et ramulis juvenibus non distincte longitudinaliter sulcatis a varietatibus omnibus ceteris *Beyeriae sulcatae* differt. **Typus:** Western Australia. 74 km W of Kumarl, *c.* 122 km N of Esperance, 10 October 1966, *P.G.Wilson 5715* (holo: PERTH).

Beyeria sp. C South West (A.S.George 9878), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Bark on lower stems shallowly fissured, persistent, dull, grey, rough. Young branchlets not distinctly longitudinally grooved. **Leaves** with petioles 1–1.7 mm long; blades ± linear, 15–35 mm long, 0.9–1.5 mm wide, with the apex acute to attenuate, ultimately terminated with an apiculate extension from midrib; apiculum stout, up to 0.2 mm long. **Male flowers** with pedicels 2–3.5 mm long. **Female flowers** with pedicels 2–9 mm long; ovary 2- or 3-locular. **Fig. 11i–l.**

***Additional selected specimens examined*: Western Australia.** Hi Vallee Property, Warradarge, towards NW corner of Butte, Jul 2001, *Hislop & Hort MH2253* (BRI); SW of Norseman, Oct 1961, *White 611015* (PERTH); 3 km ENE of Salmon Gums, Mar 1980, *Newbey 6671* (PERTH); Newdegate Research Station, 14 km W of Newdegate, Aug 1968, *Wilson 7031* (PERTH); near 260 mile post between Lake Grace and Lake King, Oct 1963, *Jefferies 631020* (PERTH); 25 km W of Lake Grace, Sep 1967, *Wilson 6212* (PERTH); Dunn Rock N.R., 30 km SW of Lake King, Apr 1984, *Backshall DJB87* (PERTH); *c.* 10 km SW [of] Lake Lockhart near access road, Oct 1982, *Coates AC25* (PERTH); near junction of West and Phillips Rivers, S of Ravensthorpe, Nov 1965, *George 7179* (PERTH); 56 miles [*c.* 90 km] W of the junction of Norseman – Esperance and Lake King roads, May 1964, *Jefferies 640512* (PERTH); 31 km due ENE of Muckinwobert Rock, 1 km NE of Melaleuca road on West Point road, Sep 1984, *Burgman 3995* (PERTH); 14 km E of Grass Patch on Steddy's road, May 1982, *van der Moezel PGV70* (PERTH); Esperance, May 1974, *Edmiston E717* (PERTH); 25.5 km NE of Mt Ridley, May 1990, *Archer 12059014* (MEL); 24 km NW of Clyde Hill, May 1983, *Burgman & McNee 1210* (PERTH).

***Distribution and habitat*:** *Beyeria sulcata* var. *gracilis* is confined to south-western Western Australia where it occurs from near Kondinin eastwards to Clyde Hill, north north east of Esperance, with a disjunct population near Eneabba (**Map 27**). It grows in open shrub mallee or heath communities on well-drained sandy soils sometimes with gravel.

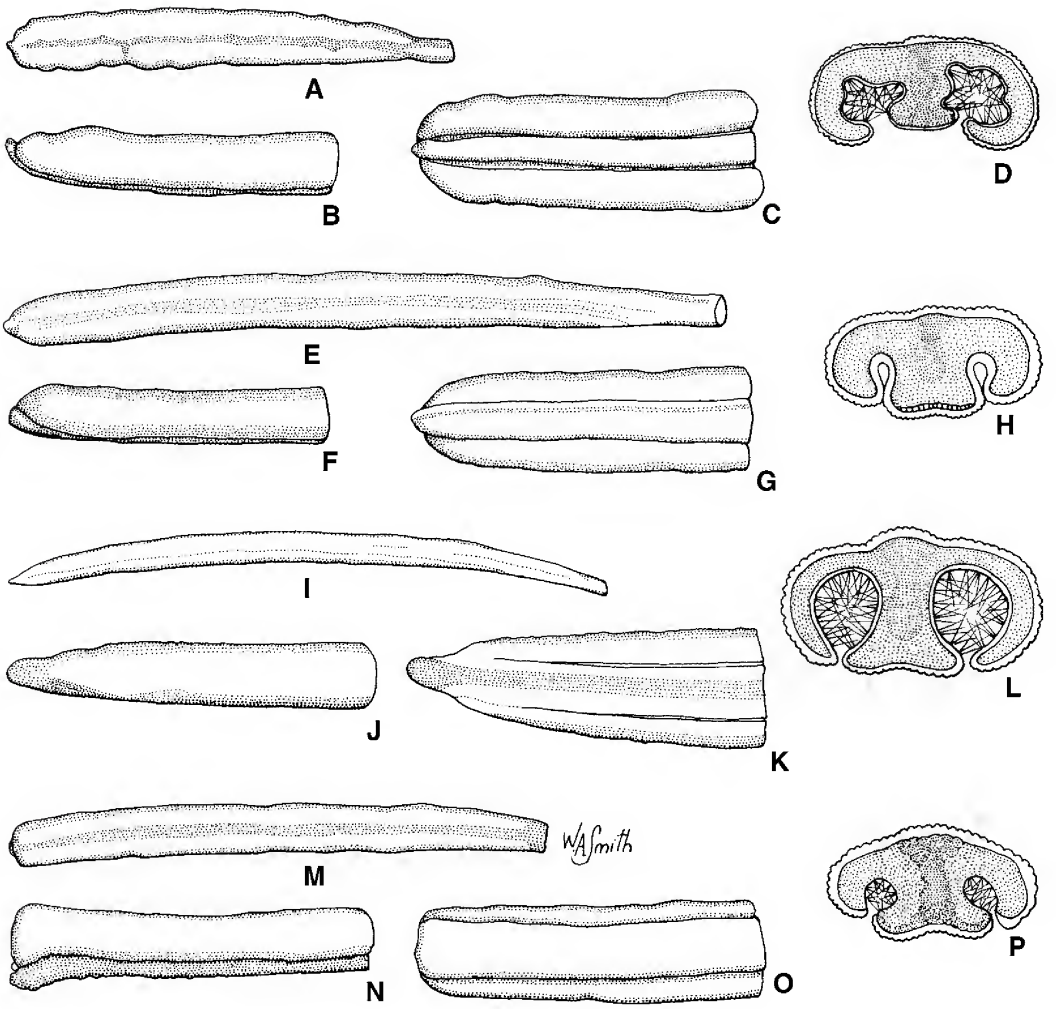

Fig. 11. Leaf shape of ***Beyeria sulcata*** varieties. ***B. sulcata* var. *sulcata***. A. abaxial view of leaf × 3. B. side view of leaf apex × 6. C. abaxial view of leaf apex × 6. D. transverse section of leaf × 12. ***B. sulcata* var. *brevipes***. E. abaxial view of leaf × 6. F. side view of leaf apex × 12. G. abaxial view of leaf apex × 12. H. transverse section of leaf × 24. ***B. sulcata* var. *gracilis***. I. abaxial view of leaf × 3. J. side view of leaf apex × 12. K. abaxial view of leaf apex × 12. L. transverse section of leaf × 24. ***B. sulcata* var. *truncata***. M. abaxial view of leaf × 6. N. side view of leaf apex × 12. O. abaxial view of leaf apex × 12. P. transverse section of leaf × 24. A–D from *Pearson 229* (PERTH); E–H from *Jefferies 640515* (PERTH); I–L from *Wilson 5715* (PERTH); M–P from *White 611017* (PERTH). Del. W.Smith.

***Phenology*:** Flowers have been collected from March to November, fruits in May, June and from August to October.

***Affinities*:** *Beyeria sulcata* var. *gracilis* differs from the other varieties of *Beyeria sulcata* in having an acute to attenuate leaf blade apex with an apiculum up to 0.2 mm long, generally longer petioles and pedicels, and its young branchlets not being distinctly longitudinally grooved.

***Etymology*:** The specific epithet is from Latin *gracilis*, thin or slender, and refers to the generally narrower leaves of this variety compared with those of *B. sulcata* var. *sulcata*.

23d. Beyeria sulcata var. **truncata** (Airy Shaw) Halford & R.J.F.Hend. **combinatio nova**

Basionym: *Beyeria brevifolia* var. *truncata* Airy Shaw, *Kew Bull.* 26: 69 (1971). **Type:** Western Australia. 92 miles [*c.* 147 km] from Lake King turnoff from Coolgardie – Esperance road, October 1963, *P.R.Jefferies 631019* (holo: PERTH; iso: PERTH).

Bark on lower stems unknown. Young branchlets longitudinally grooved. **Leaves** sessile or with petioles up to 0.7 mm long; blades linear, 10–13 mm long, 0.8–1.2 mm wide, apex rounded to truncate, ultimately apiculate with truncate extension from midrib. **Male flowers** with pedicels 0.8–1.3 mm long. **Female flowers** with pedicels *c.* 2.4 mm long; ovary 2-locular. **Fig. 11m–p.**

***Additional specimens examined*: Western Australia.** 92 miles [*c.* 148 km] W of Norseman – Esperance road along Lake King road, May 1964, *Jefferies 640514* (PERTH); 34 miles [*c.* 55 km] N of Ravensthorpe, Oct 1965, *Knox 65XO34M* (PERTH); SW of Norseman, *s.d.*, *White 611017* (PERTH).

***Distribution and habitat*:** *Beyeria sulcata* var. *truncata* is known from a small area east of Lake King, south-western Western Australia (**Map 28**). It grows on gravelly sand.

***Phenology*:** Flowers have been collected in May and October, fruits in October.

***Affinities*:** *Beyeria sulcata* var. *truncata* differs from other varieties of *B. sulcata* by its much more prominent midrib on the lower surface of leaf blades and the truncate leaf apex rather than an apiculate excurrent midrib. It also differs from *B. sulcata* var. *sulcata* and *B. sulcata* var. *gracilis* by its narrower leaf blades.

24. Beyeria villosa Halford & R.J.F.Hend. **species nova** a speciebus omnibus ceteris *Beyeriae* floribus plus minusve sessilibus et comparate parvis et ramulis juvenibus indumento villoso facile distinguibilis est. **Typus:** Western Australia. Ravensthorpe Range [precise locality withheld for conservation purposes], 25 October 1987, *K.Newbey 11802* (holo: PERTH; iso: BRI).

Beyeria sp. A Ravensthorpe (A.S.George 9474), in Florabase, http://florabase.dec.wa.gov.au [accessed June 2008].

Monoecious, erect and spreading, much-branched **shrubs** to 1.5 m high, resinous on calyx lobes and adaxial leaf surface. Young branchlets of unknown colour when fresh, ± angular soon becoming terete, densely hairy with simple and bifid hairs up to 0.7 mm long, glabrescent with age; older branchlets with grey to black shallowly fissured bark. **Leaves** petiolate; petioles 0.9–1.8 mm long, densely hairy with hairs as for young branchlets; blades narrow-oblong to linear, 7–14 mm long, 1.4–2.1 mm wide, length:width ratio 5–7:1, slightly recurved distally; adaxial surface almost glabrous except for scattered simple hairs, ± smooth, thickly resinous; abaxial surface densely hairy with ± sessile, stellate hairs *c.* 0.5 mm across; base abruptly cuneate; margins revolute to midrib concealing abaxial leaf surface; apex rounded to slightly truncate; midvein slightly impressed adaxially, abaxially raised, densely hairy with hairs as for abaxial leaf surface; secondary and tertiary veins obscure; marginal glands absent. **Flowers** ± sessile, axillary, solitary or fasciculate in 2- or 3-flowered fascicles; bracts narrow-ovate, 0.8–1.1 mm long, acute at apex, densely hairy with simple appressed hairs up to 0.6 mm long; calyx lobes 5, of unknown colour when fresh, hairy adaxially proximally, glabrous adaxially, concavo-convex, the margins entire or erose, rounded at apex; petals slightly shorter than or equal to calyx lobes, erect, glabrous abaxially and adaxially, the margins entire or erose distally; disc of 5 discrete glands; glands fleshy, ± terete, 0.2–0.3 mm long, glabrous. **Male flowers** with calyx lobes very broad-ovate, *c.* 0.6 mm long and 0.5 mm wide, surrounding androecium at anthesis; petals broad-elliptic, *c.* 0.6 mm long and 0.5 mm wide; receptacle *c.* 0.6 mm across, glabrous; stamens 10; filaments erect, 0.3–0.4 mm long, glabrous, bifid distally; anthers 0.2–0.3 mm long. **Female flowers** with calyx lobes ± appressed to and enclosing gynoecium apart from stigma, oblong or broad-ovate, *c.* 0.5 mm long and 0.3 mm wide; petals marcescent, obovate, *c.* 0.6 mm long and 0.5 mm wide; ovary subglobose, laterally compressed, *c.* 1 mm long, densely hairy, 2-locular; style 0.2–0.4 mm long, pubescent proximally; stigma discoid, *c.* 0.4 mm long, shallowly umbilicate, glabrous, with margins

entire, recurved. **Fruits** subglobose or obpyriform, 3–5 mm long, 2.3–4 mm across, 1-seeded, sparsely to moderately hairy; persistent calyx *c.* one quarter the length of mature fruit. **Seeds** ellipsoid, 3–4 mm long (including caruncle), 2–3 mm across; testa brown to black; caruncle 1–1.3 mm long, *c.* 1 mm wide, light brown. **Fig. 12.**

***Additional specimens examined*: Western Australia.** [precise localities withheld for conservation purposes] Feb 2005, *Craig 6248* (PERTH); Apr 2004, *Craig 6084* (PERTH); Feb 1998, *Craig 3626* (PERTH); May 2004, *Craig 6093* (PERTH); Dec 2004, *Mappin 10535* (PERTH); Aug 1969, *George 9474* (BRI, PERTH).

***Distribution and habitat*:** *Beyeria villosa* occurs near Ravensthorpe in south-western Western Australia (**Map 29**). It grows in mallee or tall shrubland communities often with *Eucalyptus indurata* and *Melaleuca pauperiflora* on well-drained, calcareous grey to brown clayey soils.

***Phenology*:** Flowers have been collected in August and October, fruits in October.

***Affinities*:** *Beyeria villosa* is not easily confused with any other species of *Beyeria*. It can be distinguished by its comparatively small, ± sessile flowers and the villose indumentum on its young branchlets.

***Notes*:** *Beyeria villosa* is listed as Priority Four under DEC Conservation Codes for Western Australian Flora, under the name *Beyeria* sp. A Ravensthorpe (A.S.George 9474) (Florabase, http://florabase.dec.wa.gov.au [accessed June 2008]).

***Etymology*:** The specific epithet is from Latin *villosus*, shaggy hairy, and refers to the indumentum on the young branchlets of this species.

Excluded and doubtful names

Beyeria bickertonensis Specht, *Rec. American-Australian Sci. Exped. Arnhem Land* 3: 249, fig. 8 (1958) = ***Shonia bickertonensis*** (Specht) Halford & R.J.F.Hend., *fide* Halford & Henderson (2005).

Beyeria lasiocarpa forma *denudata* Baill., *Adansonia* 6: 307 (1866), (*'denudatum'*). **Type:** [Australia.] New England, [*s. dat.*,] *C.Stuart s.n.* (herb. F.Muell.) (holo: ?MEL, *n.v.*) [= possibly ***Beyeria lasiocarpa*** Müll. Arg.].

Beyeria loranthoides Baill., *Ètude Euphorb.* 403 (1858). **Type:** [Australia. Tasmania or Port Essington,] *s. dat., Leguille* [*Guillou*] (holo: ?P *n.v.*) [= ***Tasmannia*** sp.? (Winteraceae)].

Baillon (1858), in the protologue of *B. loranthoides*, indicated some taxonomic doubt as to whether or not this species belonged in the genus *Beyeria*. Müller (1866) noted that Baillon had personally communicated to him that this species was probably better placed in *Drimys* (Winteraceae).

Beyeria opaca var. *longifolia* Grüning in A.Engler, *Pflanzenr.* H58: 69 (1913). **Type:** [Queensland.] Brisbane, *s. dat.*, *anon. per F.M.Bailey s.n.* (holo: B?) [= possibly ***Beyeria lasiocarpa*** Müll.Arg.].

Beyeria tristigma F.Muell., *Fragm.* 6: 181 (1868) [= ***Shonia tristigma*** (F.Muell.) Halford & R.J.F.Hend, *fide* Halford & Henderson (2005)].

Beyeria uncinata F.Muell. ex Baill., *Adansonia* 6: 306 (1866) [= ***Eremophila sturtii*** R.Br., *fide* Davies (1987)].

Beyeria virgata Ewart, *Proc. Roy. Soc. Victoria* n.s. 33: 226–227 (1921) [= ***Bertya virgata*** (Ewart) Halford & R.J.F.Hend., *fide* Halford & Henderson (2002)].

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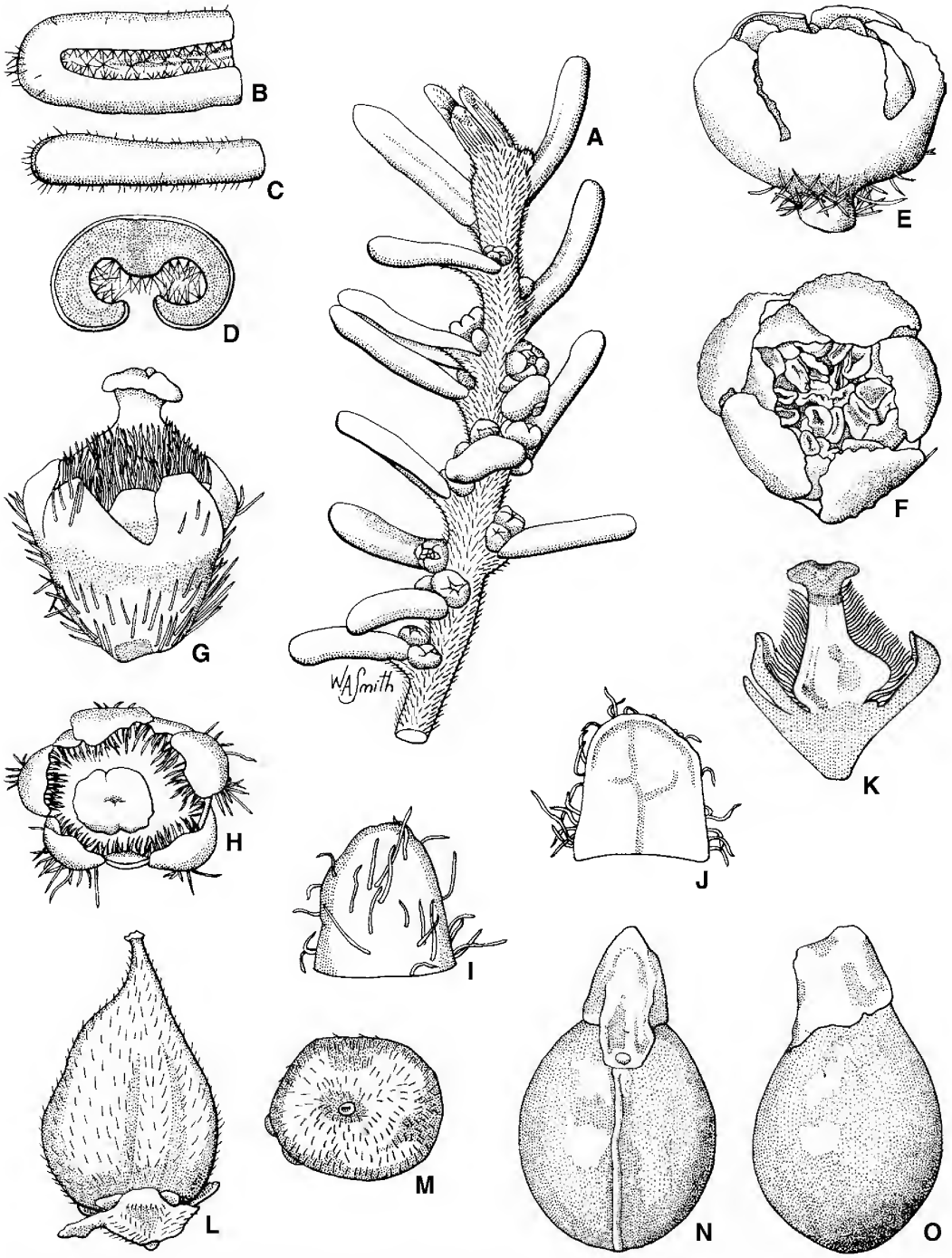

Fig. 12. ***Beyeria villosa***. A. branchlet with male and female flowers × 4. B. abaxial view of leaf apex × 12. C. side view of leaf apex × 12. D. transverse section of leaf × 12. E. side view of male flower × 24. F. face view of male flower × 24. G. side view of female flower × 16. H. face view of female flower × 16. I. abaxial view of calyx lobe from female flower × 24. J. adaxial view of calyx lobe from female flower × 24. K. transverse section of stigma and ovary × 12. L. side view of fruit × 4. M. face view of fruit × 4. N. abaxial view of seed × 12. O. side view of seed × 12. A–O from *Newby 11802* (BRI). Del. W.Smith.

Holdings Pty Ltd) who generously gave his time, financial and technical support in 2006 that allowed the first author the opportunity to study a number of the species in the field. BHP Billiton Ravensthorpe Nickel Operation is thanked for permission to access sites on mining leases in the Ravensthorpe area. Associated fieldwork from 1988 to 1992 by the second author and salary support in 1999 and 2000 for the first author was funded by grants from the Australian Biological Resources Study (ABRS), Environment Australia, which are gratefully acknowledged.

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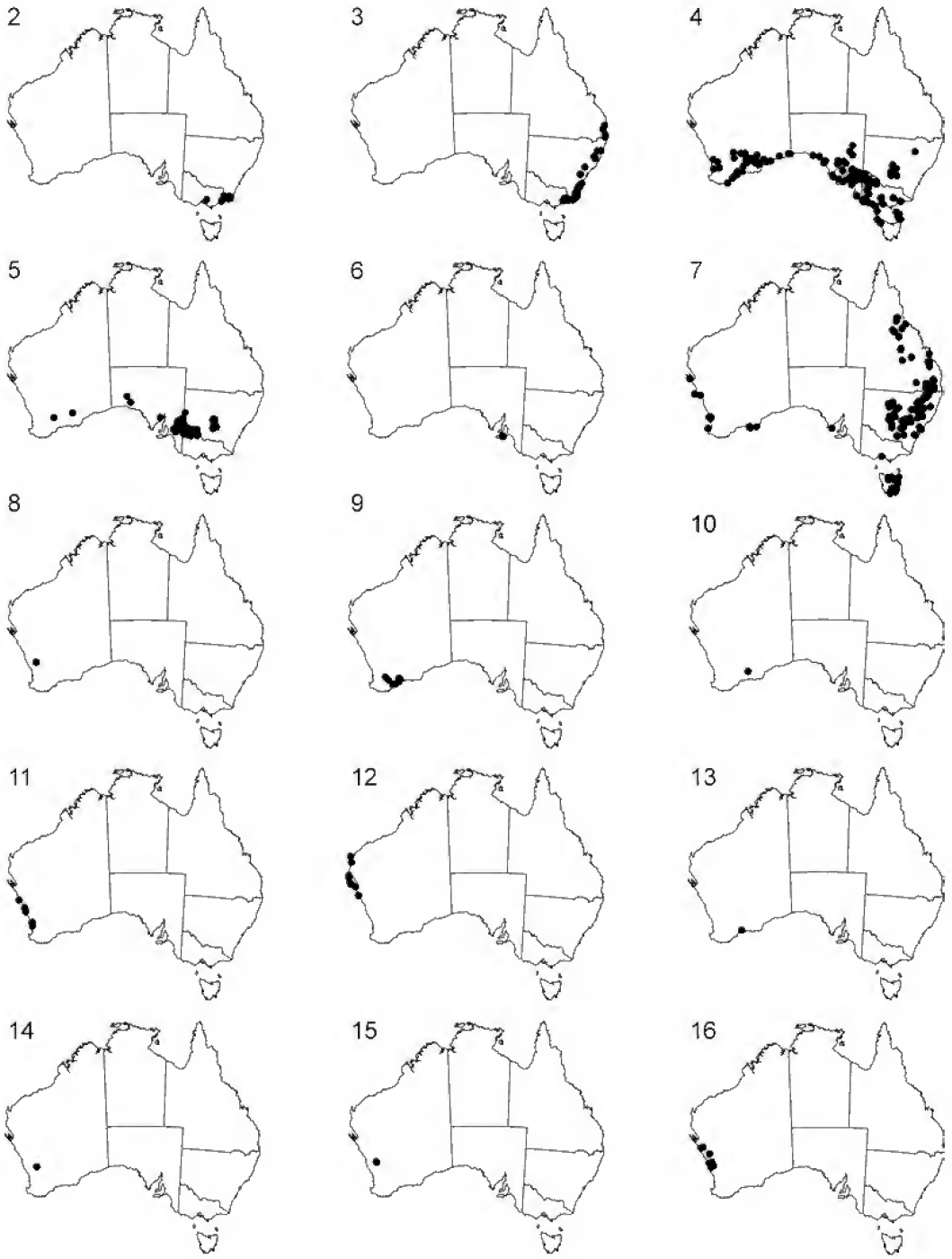
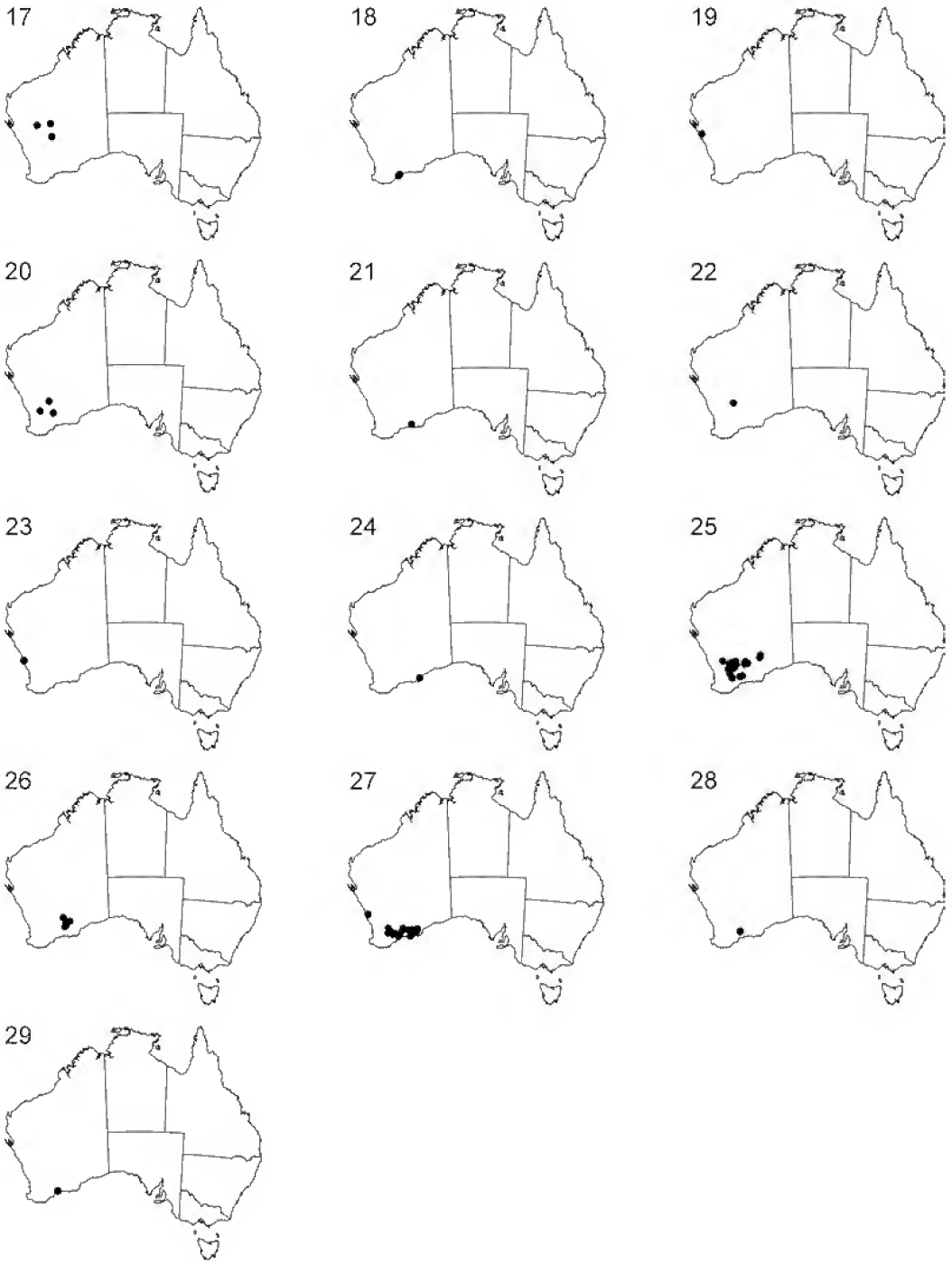


Maps 2–16. Distribution of *Beyeria* species. **2.** *B. lanceolata* **3**. *B. lasiocarpa* **4.** *B. lechenaultii* **5.** *B. opaca* **6.** *B. subtecta* **7.** *B. viscosa* **8.** *B. apiculata* **9.** *B. brevifolia* **10.** *B. calycina* **11.** *B. cinerea* subsp. *cinerea* **12.** *B. cinerea* subsp. *borealis* **13.** *B. cockertonii* **14.** *B. constellata* **15.** *B. disciformis* **16.** *B. gardneri*



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A taxonomic revision of *Erythrina* L. (Fabaceae: *Faboideae*) in Australia

A.R. Bean

Summary

Bean, A.R. (2008). A taxonomic revision of *Erythrina* L. (Fabaceae: *Faboideae*) in Australia. *Austrobaileya* 7(4): 641–658. *Erythrina* L. is represented in Australia by the following native or naturalised taxa; **E. caffra* Thunb., **E. crista-galli* L., *E. fusca* Lour., *E. insularis* F.M.Bailey, *E. numerosa* A.R.Bean, **E. speciosa* Andrews, **E.* × *sykesii*, *E. variegata* L., *E. vespertilio* subsp. *biloba* (F.Muell.) A.R.Bean and *E. vespertilio* Benth. subsp. *vespertilio*. *Erythrina fusca* is newly recorded for Australia. Distribution maps and illustrations are provided for all taxa. A dichotomous identification key catering for both flowering and fruiting material is included.

Key Words: *Erythrina,* Fabaceae, Australia, taxonomy, identification key, new species

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Introduction

Erythrina L. is a genus comprising around 120 species, occurring throughout the tropics and subtropics of the world, but with two-thirds of the species in the Americas (Krukoff & Barneby 1974).

The last comprehensive account of *Erythrina* in Australia (Bentham 1864) recorded just two species. Krukoff & Barneby (1974), in their conspectus of the genus, also recorded just two indigenous *Erythrina* species (*E. vespertilio* and *E. insularis*). Krukoff (1982) again recorded two indigenous species for Australia. He maintained *E. vespertilio*, added *E. variegata*, but excluded *E. insularis*, which he then regarded as a synonym of *E. vespertilio*. The present account includes five native and four naturalised taxa. This increase is a reflection of field-based knowledge of the native taxa and the recent naturalisation of some long-cultivated taxa.

Erythrina species are frequently cultivated as ornamental plants because of their showy (usually red) flowers. In developing countries, they are also used for shade or as a convenient trellis for vines such as pepper, betle leaves, vanilla, and yam (Whistler & Elevitch 2006). Some *Erythrina* are used as a "living fence", particularly cultivars chosen for their upright slender growth habit. Stem cuttings, up to a metre high and 10 cm diameter, will sprout roots in moist ground, and when planted close together, quickly develop into a prickly impenetrable fence. The ease by which some *Erythrina* taxa propagate themselves by cuttings or even by fallen branches is a factor in the spread of some alien taxa in Australia, particularly *E.* × *sykesii*.

Accepted for publication 1 August 2008

Materials and methods

The data and descriptions presented here are based largely on a morphological study of herbarium specimens at BRI (including spirit material), NSW and MEL, and images of type specimens at K. Most taxa have been examined in the field by the author. Leaf shapes follow Hickey & King (2000). Measurements of floral parts are based on fresh material, or material preserved in 70% alcohol, or reconstituted. Measurements of leaves, pods and seeds are based on dried herbarium material. All measurements are based on material collected from Australia, except for *Erythrina fusca*, where additional measurements were obtained from New Guinea specimens. Curved structures (e.g. standard petal, pod) were measured along the curvature, and not directly from end to end. Pod length includes the stipe.

Good quality herbarium specimens of *Erythrina* are difficult to collect and preserve. For example, it is rarely possible to collect flowers and mature fruits at the same time, and many species are leafless when in flower. Furthermore, pressed specimens are very prone to "falling apart" during the drying process. The leaves and flowers readily abscise from the branchlets, so that one is often left with a pile of separate leaflets, flowers, twigs etc. With these difficulties in mind, I have attempted to create an identification key that will cater for imperfect herbarium specimens, which, it must be said, form the greater part. *Erythrina speciosa* is included in the key to species but not treated in the main text. A description of it may be found in Green (1994).

The following abbreviations are used throughout the paper: L.A. = Logging Area, N.P. = National Park; N.S.W. = New South Wales, N.T. = Northern Territory, Qld = Queensland, S.F. = State Forest, T.R. = Timber Reserve, W.A. = Western Australia.

Taxonomy

Erythrina L., *Sp. Pl.* 2: 706 (1753), *Gen. Pl.* ed. 5, 316 (1754). **Type:** *E. corallodendron* L., [lecto: *fide* Britton (1924: 427)].

***Etymology*:** from the Greek *erythros* meaning red, in reference to the bright red flowers possessed by most species in the genus.

Trees, shrubs, or rarely herbaceous resprouters. Large conical prickles usually present on trunk and branches, occasionally on the petioles. Leaves spirally arranged, pinnately trifoliolate, in most species deciduous; stipules present but often caducous, stipels fleshy and glandular. Leaflets pinnately-veined though often 3-veined at the base, intramarginal veins absent. Inflorescences terminal or axillary, widely spreading from distal parts of branchlets, pseudoracemose, indeterminate, oldest flowers at the base, flowers borne in fascicles, bracts and bracteoles deciduous. Calyx with a tubular or obconical hypanthium, often split down one side at anthesis; calyx lobes or teeth 1–5, usually obscure and sometimes lacking. Corolla showy, the keel and wing petals usually much smaller than the standard. Stamens 10, with 9 filaments connate above the middle, alternately longer and shorter, the upper filament free or basally connate with the staminal tube; anthers bithecate with longitudinal dehiscence, dorsifixed. Style terminal, incurved, not bearded. Fruits dehiscent, linear or linear-oblong, often sickle-shaped, more or less moniliform. Seeds estrophiolate, ovoid, ellipsoid or sub-globose, with a very hard testa.

Chromosome number: $2n = 42$ (Hennessy 1991)

Key to native and naturalised taxa of *Erythrina* in Australia

1 Leaflets elliptical (broadest near the middle), 1.5–2.3 times longer than wide 2

1. Leaflets not elliptical (deltoid, obdeltoid, rhomboid, or variously lobed), length 0.19–1.5 times that of width 3

2 Leaflets with minute waxy reticulations below[1]; one or two prickles usually present on petioles; pedicels 13–25 mm at anthesis; standard petal and keel petals pink to red; seeds black with brown streaks, 2–6 per pod . . . . . **7. *E. crista-galli**

2. Leaflets without waxy reticulations below; petioles without prickles; pedicels 5–13 mm at anthesis; standard petal and keel petals mainly yellow-orange; seeds uniformly dark brown, 6–12 per pod . . . . . **8. E. fusca**

[1] high magnification needed; not obvious on every leaflet

3 Indumentum persistent on abaxial veins of fully expanded leaves; standard petal straight, 7–11 mm wide . . . . . ***E. speciosa** Andr.[2]
3. Indumentum absent from fully expanded leaves; standard petal at least slightly curved, 12–46 mm wide 4

4 Indumentum comprising tiny stellate or dendritic hairs; keel petals free (indigenous taxa) 5
4. Indumentum comprising simple hairs; keel petals connate (naturalised taxa) 9

5 Leaflet margins not sinuate or lobed, strongly 3-veined at base with veins converging at point of petiole attachment (littoral habitats) 6
5. Leaflet margins sinuate or with lateral lobes, either not 3-veined at base or veins converging inside lamina (not in littoral areas) 7

6 Terminal branchlets with dark conical prickles; corolla orange-red at anthesis; pods indehiscent, only slightly constricted between seeds, with raised anastomosing veins; seeds brown to purplish-brown . . . . . **1. E. variegata**
6. Terminal branchlets without prickles; corolla greenish-yellow at anthesis; pods dehiscent, highly constricted between seeds, smooth or faintly striate; seeds bright red . . . . . **2. E. insularis**

7 Leaflets broadly V-shaped, central lobe absent or up to 12 mm long, lateral lobes parallel-sided, 32–66 mm long and 5–17 mm wide . . . . . **3b. E. vespertilio** subsp. **biloba**
7. Leaflets ± rhomboid or obdeltoid, central lobe well developed (8–40 mm long), lateral lobes tapering, 20–50 mm wide at their base 8

8 Pods 7–14 cm long, containing 1–4(–5) seeds; standard 32–40 mm long,anthers 2.1–2.8(–3.1) mm long; fascicles 8–15(–25) mm apart . . . . . **3a. E. vespertilio** subsp. **vespertilio**
8. Pods 13–24 cm long, containing 5–11 seeds; standard 39–54 mm long, anthers 2.8–4.3 mm long; fascicles 1.5–8 mm apart . . . . . **4. E. numerosa**

9 Standard slightly recurved; terminal leaflet 95–180 mm long; fruits never develop . . . . . **6. *E. × sykesii**
9. Standard strongly recurved; terminal leaflet 55–105 mm long; fruits consistently develop. . . . . **5. *E. caffra**

[2] this species is included in the key on the basis of reported naturalisation on Norfolk Island (Green 1994). No naturalised material has been seen by the present author.

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1. Erythrina variegata L., *Herb. Amboin.* 10 (1754). **Type:** illustration of "Gelala Alba" in Rumphius, *Herb. Amboin.* 2: 234, t. 77 (holo: the illustration), *fide* Merrill (1917: 33, 276).

Erythrina corallodendrum var. *orientalis* L., *Sp. Pl.* 706 (1753); *E. variegata* var. *orientalis* (L.) Merr., *Interpr. Herb. Amboin.* 276 (1917). **Type:** India. Malabar. "Mouricou" in Rheede, *Hort. Malab.* 6: 13, t. 7 (lecto: the illustration), *fide* Krukoff & Barneby (1974: 431).

Erythrina indica Lam., *Encycl.* 2(1): 391 (1786). **Types:** t. 7 of Rheede, *Hort. Malab.* 6: 13 (syn: *n.v.*); t. 76 'Gelala litorea' of Rumph., *Herb. Amboin.,* 2: 234 (syn: *n.v.*).

Erythrina phlebocarpa F.M.Bailey, *Queensland Agric. J.* 1: 368 (1897); *E. indica* var. *phlebocarpa* (F.M.Bailey) Domin, *Biblioth. Bot.* 89: 222 (1926). **Type:** Queensland. Cook District: Newcastle Bay, Cape York Peninsula, *s.dat., F.L.Jardine s.n.* (lecto: BRI [AQ22856], the sheet bearing the fruit), *fide* Krukoff (1972: 135).

***Illustrations*:** Cooper & Cooper (2004: 210); Verdcourt (1979: 428); Whistler & Elevitch (2006: 331, 333); Williams (1979: 110).

Tree 5–25 m high, deciduous. Bark mostly smooth, with shallow longitudinal furrows, grey to grey–brown. Trunk and branches bearing large scattered conical prickles, terminal branchlets with small black prickles. Indumentum comprising minute stellate or dendritic hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green or sometimes strikingly variegated green and yellow, not waxy below. Petioles unarmed, terete, 40–140 mm long; petiolule of basal leaflets 6–11 mm long; terminal leaflet broadly ovate, deltoid or rhomboid, 70–190 mm long, 80–210 mm wide, even larger on young plants, length/breadth ratio 0.70–1.05, apex acute to acuminate, base obtuse or truncate; lateral lobes absent; basal leaflets similar but conspicuously smaller. Leaflet venation penninerved, basal pair of lateral veins converging at point of petiole attachment. Inflorescences borne on leafless branches, >100-flowered, 20–40 cm long, rachis and peduncles about same length, peduncles 6–9 mm diameter; fascicles 3-flowered, often two or three fascicles at same position along rachis, each fascicle group 4–6 mm apart on rachis, pedicels 5–9 mm long at anthesis; calyx tubular in bud, 19–35 mm long, a ventral longitudinal split developing as corolla expands, extending almost to base of calyx, apex truncate or with 2–3 filiform lobes each 2–6 mm long; all petals red to scarlet, prominently veined; standard 52–68 × 16–23 mm, apex obtuse, recurved and exposing staminal column; wings and keel similar, wings 16–20 mm long; keel petals 16–20 mm long, free, obtuse; stamens 57–70 mm long, anthers 2.9–4.3 mm long, brown; ovary hairy, ovules 11–16. Pods straight, 8–25 cm long, 1.7–2.8 cm wide at widest point, scarcely narrowed between the seeds, outer surface with raised anastomosing veins, ± indehiscent and fragmenting when mature, glabrous at maturity, seeds usually not easily visible. Seeds 2–10 per pod, ellipsoidal, 13–18 mm long, uniform in colour, brown to purplish-brown, with a dark hilum. *Indian coral tree*. **Fig. 1F**.

***Additional specimens examined*: Northern Territory.** Cato River, 4 km S of mouth, on headland, Apr 1996, *Cowie 6705* (MEL); Inglis Island, Dec 1987, *Dunlop 7437* (BRI, DNA). **Queensland.** Cook District: Dauan Island, Torres Strait, Sep 1971, *Lawrie s.n.* (BRI [AQ003901]); Warraber Island, Torres Strait, Jul 1996, *Waterhouse 3903* (BRI); Murray Island, Aug 1970, *Lawrie 105* (BRI); Palfrey Island, near Lizard Island, Jul 1990, *Batianoff 12135* (BRI); Quarantine Bay, Cooktown, Aug 1977, *Scarth-Johnson 574A* (BRI); Low Isles, 12 km NE of Port Douglas, Jun 1973, *Everist 9964* (BRI); Green Island, Aug 1973, *Stoddart 4247* (BRI); Clump Point, ESE of El Arish, Sep 1974, *Moriarty 1574* (BRI, CANB); Clump Point, near Mission Beach, Jan 2002, *Cooper WWC1668 & Cooper* (BRI). North Kennedy District: Goold Island, NE Side, Aug 1970, *Everist 9696* (BRI); Cardwell Gap, 13 km NNE of Ingham, Oct 1976, *Everist s.n.* (BRI [AQ 198159]); Port Denison, *s.dat.*, *Fitzalan s.n.* (MEL); Daydream Island, Apr 1990, *Batianoff 900461* (BRI); Conway N.P., Airlie Beach, Funnel Bay, May 1994, *Batianoff 9405221* (BRI); Wilson's Beach, Conway, SE of Proserpine at head of Repulse Bay, Apr 1985, *Rodd 4439 & Hardie* (BRI, NSW); Hayman Island, Jun 1934, *White 10123* (BRI). South Kennedy District: Lindeman Island, Nov 1985, *Batianoff 3332 & Dalliston* (BRI); Cape Hillsborough, R60, Ossa, May 1975, *Hyland 8220* (BRI); Dolphin Heads, Mackay, Sep 1994, *Batianoff 940912 & Saltman* (BRI). Port Curtis District: Eurimbula N.P., 6 km NW of Agnes Water, Oct 1990, *Gibson 1360* (BRI, MEL).

***Distribution and habitat*:** *Erythrina variegata* is widely distributed in coastal areas from Africa to the eastern Pacific Ocean, including Tanzania, Madagascar, India, Burma, Vietnam, southern China, Malesia, New Caledonia and Tahiti (Krukoff 1972). It is not native to North or South America but was introduced there over 200 years ago. In Australia, it is indigenous on the north-eastern coast of N.T., in Qld from Torres Strait and along the east coast as far south as Agnes Waters (**Map 6**). It also occurs on some island territories of Australia, *viz.* Christmas Island and North Keeling Island (Du Puy & Telford 1993). It inhabits littoral rainforest or open forest behind beaches and headlands, and along the tidal sections of rivers.

***Phenology*:** Flowers from August to October; fruits are recorded for nearly every month of the year.

***Notes*:** Krukoff (1972) insisted that the leaves of the type collection of *Erythrina phlebocarpa* belong to the African species *E. lysistemon*, while the fruits are of *E. variegata*. He did not give any reasons for identifying the leaves as *E. lysistemon*, and I cannot discern any distinctive feature of the

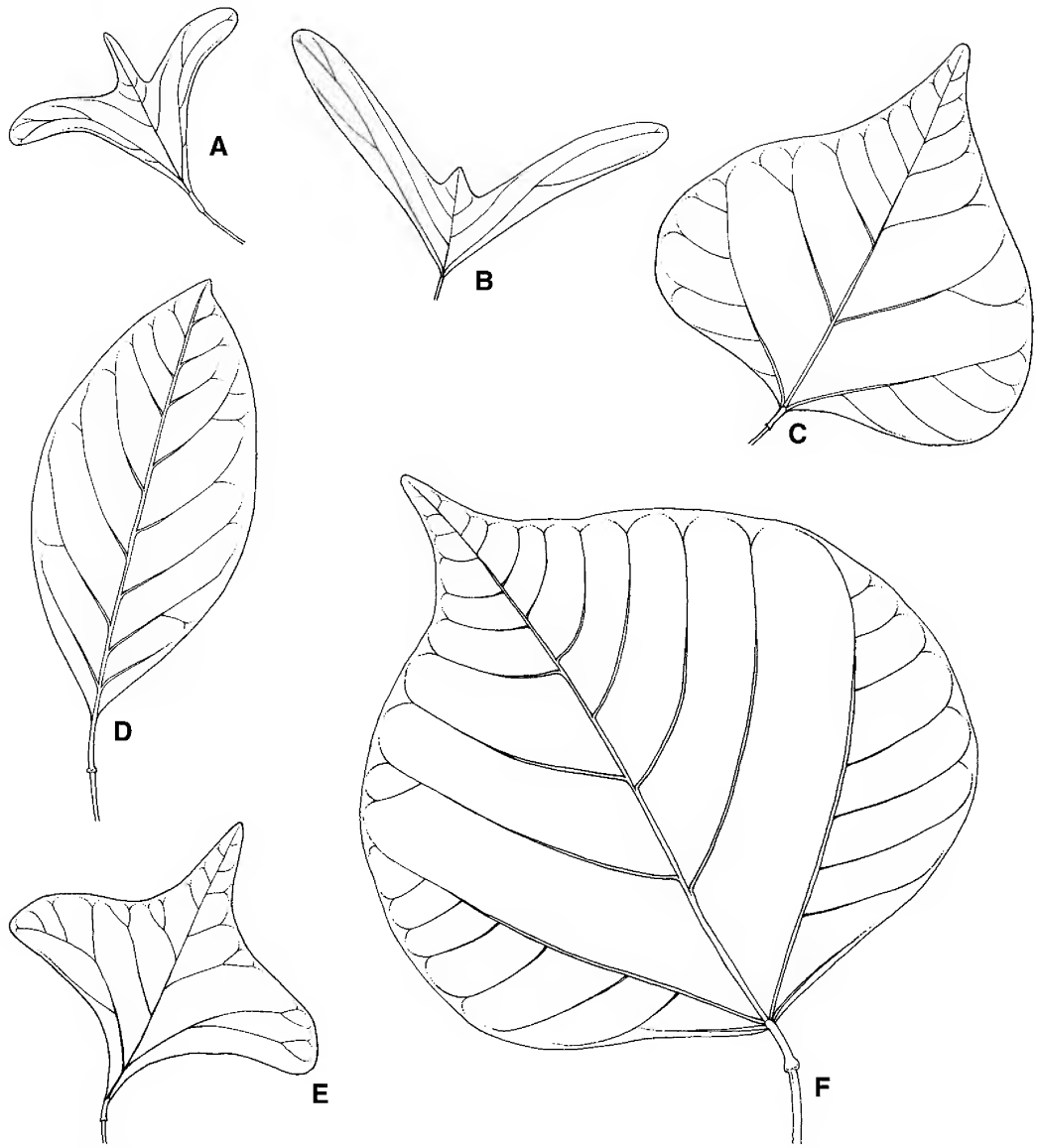

Fig. 1. Terminal leaflets of *Erythrina* spp. A. ***E. vespertilio*** subsp. ***vespertilio***. B. ***E. vespertilio*** subsp. ***biloba***. C. ***E. caffra***. D. ***E. crista-galli***. E. ***E. numerosa***. F. ***E. variegata***. A from *Bean 8492*; B from *McRae s.n.* (AQ501724); C from *Stephens GBS12*; D from *Hall & Bird s.n.* (AQ659717); E from *Grimshaw G8 et al.*; F from *Moriarty 1574*. All BRI. Del. B. Connell.

foliage of *E. lysistemon* that would support the claim. The foliage is entirely consistent with *E. variegata*, and it seems clear that all parts of the type collection are referable to that species. Krukoff's lectotypification of *E. phlebocarpa* on the fruiting sheet at BRI must however be followed.

This species is widely utilised by mankind throughout its range, as a fodder tree, a trellis plant, or as a living fence (Whistler & Elevitch 2006).

***Etymology*:** From the Latin *variegatus* meaning variegated. A variant of the species has leaves displaying variegation

(conspicuously white veins on an otherwise green leaf). Apparently this variant was the one described by Linnaeus.

2. Erythrina insularis F.M.Bailey, *Queensland Agric. J.* 1: 228 (1897). **Type:** Queensland. Cook District: Turtle Island, June 1897, *F.M. Bailey 29* (holo: BRI; iso: MEL).

***Illustration*:** Cooper & Cooper (2004: 210).

Tree 4–12 m high, deciduous. Bark mostly smooth, with pale longitudinal fissures, grey to brown. Trunk and branches with or without prickles, terminal branchlets without prickles. Indumentum comprising minute stellate or dendritic hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green, not waxy below. Petioles unarmed, terete, 45–135 mm long; petiolule of basal leaflets 4–10 mm long; terminal leaflet deltoid to rhomboid, 60–100 mm long, 55–120 mm wide, length/breadth ratio 0.78–1.11(–1.32), apex obtuse or acute; base obtuse to broadly cuneate; margins sometimes slightly sinuate. Leaflet venation penninerved, basal pair of lateral veins converging at point of petiole attachment (i.e. 3-veined at base). Inflorescences borne on leafless branches, 15–40-flowered, 7–19 cm long, rachis and peduncles about same length, peduncles 3.5–6.3 mm diameter; fascicles 3-flowered, often two or three fascicles at same position along rachis, each fascicle group 2–7 mm apart on rachis, pedicels 7–11 mm long at anthesis; calyx tubular in bud, 15–19 mm long, truncate, a longitudinal ventral split developing as corolla expands, extending almost to base of calyx; petals initially pale yellow, senescing to orange or scarlet, prominently veined; standard 25–41 × 12–15 mm, apex obtuse, strongly recurved and exposing staminal column, wings and keel very similar, wings 12–16 mm long; keel petals 14–15 mm long, free, obtuse; stamens 35–40 mm long, anthers 3.2–4.2 mm long, brown; ovary hairy, ovules 8–11. Pods often curved at maturity, 7–17 cm long, 1.3–1.8 cm wide at widest point, conspicuously narrowed between the seeds, glabrous, dehiscent, outer surface with faint raised parallel veins. Seeds 2–7, ellipsoidal, 9.5–12 mm long, uniform in colour, scarlet to red, with a pale or dark hilum, often remaining attached to pod and easily visible. **Fig. 2B**.

***Additional specimens examined*: Queensland.** Cook District: Gabba Island, Torres Strait, Jul 1996, *Waterhouse 3891* (BRI); Dalrymple Island, Jan 1998, *Waterhouse 4766* (BRI); Pumpkin Island, Jun 2003, *Wannan 3101 & Buosi* (BRI); Coconut Island, central Torres Strait, Sep 1971, *Lawrie s.n.* (BRI [AQ008846]); Coconut Island, Aug 1994, *Wannan 64* (BRI); western end of Warraber Island, Torres Strait, May 2003, *Hucks LAH164* (BRI, CANB); Warraber (formerly Sue) Island, Torres Strait, Jun 1995, *Waterhouse 3668* (BRI); Milman Island, Cape York, Jan 1995, *Card MC24* (BRI); On coast, near Cowal Creek and False Orford Ness, Sep 1987, *Gitay HG101* (BRI); Hannibal Island, near Shelburne Bay about 16 km W of Helby Hill, Jul 1969, *Done s.n.* (BRI [AQ007594]); Bird Island, Nov 1973, *Stoddart 5090* (BRI); Farmer Island N.P., Great Barrier Reef Marine Park, Dec 2004, *Batianoff 31229* (BRI); Farmer Island, Feb 1991, *Card FAR1* (BRI); ex Haggerstone Island, cultivated Tolga, Oct 2001, *Ford AF3028* (BRI).

***Distribution and habitat*:** *Erythrina insularis* is endemic to Qld. It is confined to the Torres Strait and north-eastern Cape York Peninsula (**Map 4**). It inhabits semi-evergreen notophyll vine forest, often as an emergent. Nearly all records are from coral islands or cays, but there is a single known occurrence from a continental island (Gabba Island), and one record from the mainland (Cowal Creek).

***Phenology*:** Flowers from July to November; fruits from December to July.

***Notes*:** Adema (1996) included *Erythrina merrilliana* Krukoff as a synonym of *E. insularis*. The former was described from Papua New Guinea (Central Province, 700 metres altitude). New Guinea specimens may be consistently distinguished by the 5–6 mm long calyx lobes and the orange to red corolla (calyx lobes lacking, corolla initially pale-yellow, senescent flowers orange for *E. insularis*). These characters, in addition to marked differences in habitat, indicate that they are distinct species.

Erythrina insularis is sympatric with *E. variegata*. For example, both species have been collected from Warraber island (*Waterhouse 3903*; *Hucks 164*). Sterile specimens of *E. insularis* and *E. variegata* are of very similar appearance, but can be distinguished by the presence (*E. variegata*) or absence (*E. insularis*) of prickles on the

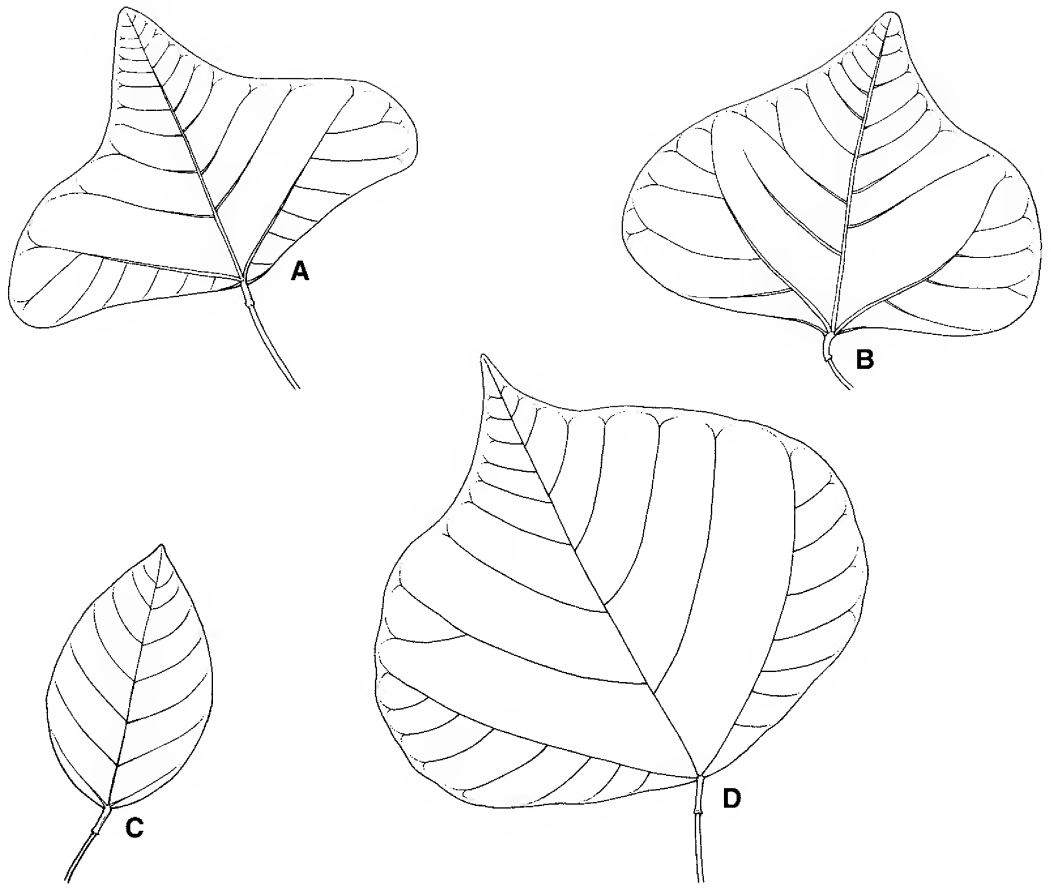

Fig. 2. Terminal leaflets of ***Erythrina*** spp. A. ***E. vespertilio*** subsp. ***vespertilio***. B. ***E. insularis***. C. ***E. fusca***. D. ***E.*** × ***sykesii***. A from *Hinz 533*; B from *Hucks 164*; C from *Morris s.n.* (AQ497997); D from *Batianoff 0302118*. All BRI. Del. B. Connell.

terminal branchlets. Fertile plants may be readily identified. The flowers of *E. insularis* are pale greenish-yellow on the day of opening, changing to orange-red when senescent, standard 25–41 mm long (*E. variegata* flowers orange-red at all stages, standard 52–68 mm long); the pods of *E. insularis* are smooth or faintly striate, moniliform and the seeds bright red (pods reticulately veined, not constricted, seeds brown or purplish-brown for *E. variegata*).

Bailey noted in the protologue that some trees were completely without prickles, and some recent collectors have noted the same. Card (2001) recorded that (for Milman Island) prickles or spines are absent from the stems of the species.

Card (2001) discovered that the seeds of *Erythrina insularis*, in contrast to *E. variegata* and *E. fusca*, do not float in seawater, but rather sink immediately to the bottom. However, she said that seeds could still be ocean dispersed when attached to pods or caught up in rafts of drift material. This dispersal difficulty perhaps explains why *E. insularis* has such a restricted distribution compared to *E. variegata* and *E. fusca*.

Etymology: From the Latin *insularis*, meaning an island, because of the island location of the first collection.

3. Erythrina vespertilio Benth. in T.L. Mitchell, *J. Exped. Trop. Australia* 218 (1848); *Corallodendron vespertilio* (Benth.) Kuntze, *Revis. Gen. Pl.* 1: 173 (1891). **Type:** Queensland. WARREGO DISTRICT. Subtropical New Holland [near Mt Faraday], 29 June 1846, *T.L. Mitchell 189* (lecto: K, *fide* Krukoff & Barneby (1974: 435)).

Tree 3–20 m high, deciduous. Bark corky, fissured or furrowed, creamy, grey, grey-brown or yellowish cream-grey. Trunk and branches bearing prickles, terminal branchlets with or without prickles. Indumentum comprising minute stellate or dendritic hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green, not waxy below. Leaflet venation penninerved, either not 3-veined at base or veins converging above base of leaflet. Inflorescences borne on leafless branches, 13–35-flowered, 11–33 cm long, rachis and peduncle about the same length, peduncle 1.5–4.2 mm diameter; fascicles 1–3-flowered, often two fascicles at same position along rachis, each fascicle group 8–15(–25) mm apart on rachis, pedicels 12–24 mm long at anthesis; calyx tubular in bud, 15–21 mm long, truncate or with minute lobes, a longitudinal lateral split developing as corolla expands, extending almost to base of calyx; all petals orange-red to scarlet, prominently veined; standard 32–40 × 16–20 mm, apex obtuse, strongly recurved and exposing staminal column; wing and keel petals about equal in size and shape; wings 8–16 × 3–5.5 mm long; keel petals 10–13 × 3–5.5 mm long, free, obtuse; stamens 35–45 mm long, anthers 2.1–2.8(–3.1) mm long, pale brown to brown; ovary densely stellate–hairy, ovules 6–8. Pods slightly curved when mature, 7–14 cm long, 1.1–1.5 cm wide at widest point, conspicuously narrowed between the seeds, glabrous at maturity, dehiscent and with seeds easily visible, outer surface smooth or with faint raised parallel veins. Seeds 1–4, rarely 5, ellipsoidal, uniform in colour, orange to scarlet, with a pale hilum. *Bat's wing coral tree*.

***Distribution*:** This species is endemic to Australia and comprises two subspecies.

***Typification*:** There are two sheets at K collected by T. Mitchell, both available to Bentham when drawing up the protologue. Krukoff & Barneby (1974) cited "*Mitchell 189* (1846) (K-holotype)", interpreted here as lectotypification of the name.

***Etymology*:** From the Latin *vespertilio*, a bat. This refers to the shape of the leaflets, which resemble the profile of a bat in flight.

The subspecies can be distinguished as follows:

Leaflets broadly V-shaped; central lobe absent or up to 12 mm long, lateral lobes parallel-sided, 32–66 mm long and 5–17 mm wide; seeds 11.5–16.5 mm long . . . . . subsp. **biloba**

Leaflets rhomboid to obdeltoid, central lobe well developed (8–40 mm long), lateral lobes tapering, 20–50 mm wide at their base; seeds 10–11.5 mm long . . . . . subsp. **vespertilio**

3a. Erythrina vespertilio Benth. subsp. **vespertilio**

Erythrina vespertilio var. *vespertilio*, Domin, Biblioth. Bot. 89: 221 (1926).

Erythrina vespertilio var. *typica* Domin, *Biblioth. Bot.* 89: 221 (1926), *nom. illeg.*

***Illustrations*:** Brock (1988: 149), as *E. variegata* var. *orientalis*; Williams (1979: 111); Cooper & Cooper (2004: 211).

Petioles unarmed, terete, 40–82 mm long; petiolule of basal leaflets 5–6 mm long; terminal leaflet 28–85 mm long, 33–112 mm wide, length/breadth ratio mostly 0.6–0.84, to 1.06 on Cape York peninsula; base cuneate; terminal lobe 8–40 mm long, apex acuminate, acute or obtuse; margins sinuate, forming obtuse, tapering, often prominent lateral lobes 14–38 mm long, 20–50 mm wide at their base. Seeds 10–11.5 mm long. **Figs 1A, 2A, 3.**

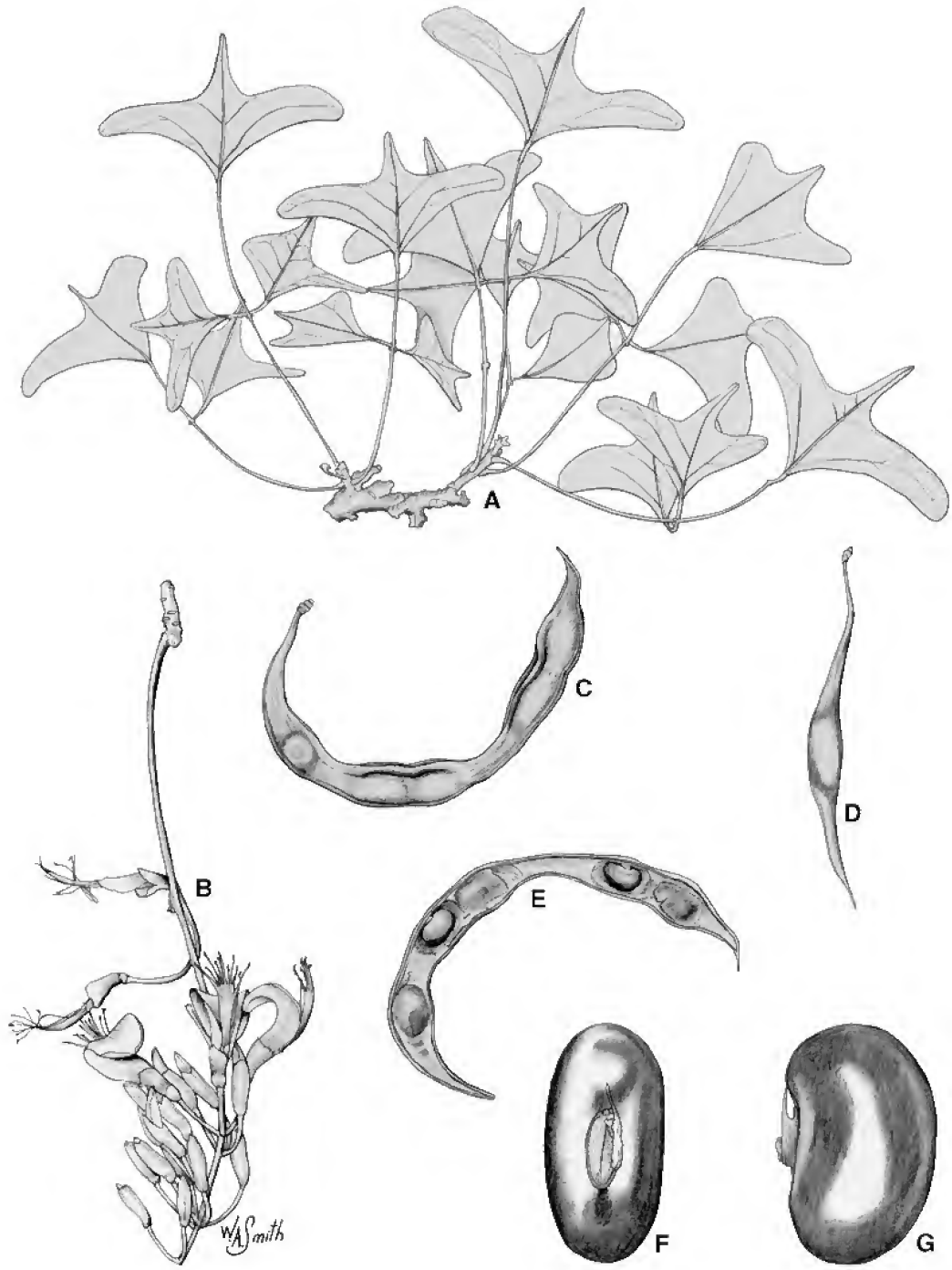

Fig. 3. ***Erythrina vespertilio*** **subsp.** ***vespertilio***. A. leafy branchlet × 0.5. B. single inflorescence bearing buds and flowers × 0.5. C, E. the two halves of an atypically long fruit containing seeds × 0.5. D. typical fruit × 0.5. F, G. seed × 3. A & B from *Forster PIF7686* (BRI); C–G from *Forster PIF7730* (BRI). Del. W. Smith.

***Additional selected specimens examined*: Western Australia.** near Poompangala Hill, 9 km NW of Kalumburu, May 1993, *Cowie 4277* (MEL); on road to Warrender, past Lone Dingo turn off, Mitchell Plateau, Sep 1978, *Clayton-Greene s.n.* (MEL2117860A); near Ord River, 1884, *Johnston s.n.* (MEL72472A); on ridge between Calder River and billabong, *c.* 5 km N of Walcott Inlet, Manja Camp, Aug 2001, *Shepherd 62* (MEL). **Northern Territory.** Groote Eylandt, Hemple Bay, May 1948, *Specht s.n.* (BRI [AQ230649]); Nabarlek, Jun 1989, *Hinz 533* (BRI); Oenpelli, Oct 1948, *Specht 1309* (BRI); about SW of Brock's Creek, Jul 1946, *Blake 16478* (BRI); Rockhole Creek, Nitmiluk, Jul 1990, *Evans 3285* (BRI); near mouth of Foelsche River, Jul 1948, *Perry 1831* (BRI); Guy Cave Area, 16 miles Cave Reserve, south of Katherine, May 1978, *Webb 13028* (BRI). **Queensland.** Cook District: Thursday Island, Jul 1975, *Stocker 1238* (BRI); Archer River, Wenlock – Coen road, Jul 1948, *Brass 19760* (BRI); Larrod's Hill, Sep 1976, *Hyland 8955* (BRI). Burke District: Karumba, Aug 1943, *Blake 15132* (BRI, MEL). North Kennedy District: Lansdown, *c.* 25 miles [40 km] S of Townsville, Mar 1971, *Robertson T203* (BRI); Mt Abbot, 50 km W of Bowen, Oct 1992, *Bean 5202* (BRI). South Kennedy District: 2 km SW of Dudgeon Point, Mackay, Feb 1993, *Batianoff 930252* (BRI); 1 km S of Cape River, on Gregory Developmental Road, Nov 1991, *Thompson 128* (BRI). Leichhardt District: *c.* 3.2 km S of Umolo turnoff, Nov 1973, *Williams 367* (BRI). Port Curtis District: Pine Mt, Marlborough, May 1998, *Batianoff 9805213* (BRI); Mt Castletower N.P., eastern slopes, Many Peaks Range, Feb 1995, *Forster PIF16319* (BRI). Burnett District: Bania S.F., north of Mt Perry, Mar 1995, *Bean 8492* (BRI, MEL); 6 km NNE of Coalstoun Lakes, Apr 1991, *Forster PIF7860* (BRI). Wide Bay District: Delley Road, N of Biggenden, Nov 2001, *Bean 18057* (BRI, MEL); 2 km NNE of Didcot, Nov 1997, *Forster PIF21858* (BRI). Moreton District: Redbank Plains, Ipswich, Jan 1992, *Bird s.n.* (BRI [AQ520215]).

***Distribution and habitat*:** This subspecies is widespread across northern and north-eastern Australia (Kimberley region of W.A., Top End of N.T. and the eastern half of Qld). In Qld it extends as far north as Thursday Island, and south to around Ipswich (**Map 8**).

***Phenology*:** For northern Australia (the Top End of N.T., Gulf of Carpentaria, far north Qld), flowering occurs from June to September; in central and southern Qld, flowering occurs from October to December; fruits may be found from November to April.

***Notes*:** While the leaflets of *Erythrina vespertilio* subsp. *vespertilio* are strongly 3-veined at the base, the veins almost always converge at a point inside the lamina surface, i.e. removed from the point of insertion of the petiole. This provides a very useful way to distinguish sterile specimens of *E. vespertilio* from most other Australian species.

3b. Erythrina vespertilio subsp. **biloba** (F.Muell.) A.R.Bean, **combinatio et status nova**

Basionym: *Erythrina biloba* F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 21 (1857); *E. vespertilio* var. *biloba* (F.Muell.) Domin, *Biblioth. Bot.* 89: 221 (1926). **Type:** Northern Territory or Western Australia. at the foot of a little granite range at the head of Hooker's Creek and Sturt's Creek, January 1856, *F. Mueller s.n.* (holo: MEL 72396; iso: K).

***Illustration*:** Milson (2000: 82–83).

Petioles unarmed, terete, 48–110 mm long; petiolules 3–5 mm long; leaflets broadly Y-shaped, terminal leaflet 14–36 mm long, 33–144 mm wide, length/breadth ratio 0.19–0.32 (–0.51); base cuneate to attenuate; terminal lobe often absent, sometimes present, 0–12 mm long, apex acute or obtuse; lateral lobes 32–66 mm long, 5–17 mm wide, straight or somewhat recurved, length/breadth ratio 3.3–9.1, obtuse, parallel–sided. Seeds 11.5–16.5 mm long. **Fig. 1B**.

***Additional selected specimens examined*: Western Australia.** Nickol Bay, 1876, *Crouch s.n.* (MEL); Blackfellows Creek crossing on Winnama Yards track, 3 km S of Texas Downs road, Jul 1984, *Scarlett 84–387* (MEL); Fortescue River, 1878, *Forrest s.n.* (MEL). **Northern Territory.** 6 miles [10 km] N of Aileron Homestead, Mar 1955, *Winkworth 868* (BRI); Barrow Creek, 1880, *Chandler s.n.* (MEL); Yarraji, 63 km NE Bob Well, Lander River, Jul 1989, *Latz 11553* (MEL); Singleton, 240 miles [386 km] N of Alice Springs, Jan 1950, *Everist 4241* (BRI); 13 miles [21 km] NW of Napperby Homestead, May 1956, *Chippendale 2059* (BRI, NSW); *c.* 4 miles [c. 6 km] NNW of Mt Ziel, Jul 1968, *Beauglehole 27180* (MEL); N side of Mt Liebig, Jul 1988, *Corrick 10336* (MEL); Hatches Creek, Nov 1968, *Byrnes NB1132* (BRI); Redbank Gorge, Heavitree Range, Sep 1969, *Gittins 2038* (BRI, NSW). **South Australia.** north of Oodnadata, 1915, *Freeman s.n.* (NSW). **Queensland.** Burke District: Lake Moondara road, Mt Isa, Nov 1996, *Dean SB72* (BRI); 58 miles [93 km] SSE of Camooweal, May 1948, *Perry 729* (BRI). Mitchell District: Grey Range, about 3 km W of Mount Grey, on Blackall – Yaraka road, Nov 1990, *McRae s.n.* (BRI [AQ501724]); Parkgate, *c.* 55 km SE of Barcaldine, Jan 1995, *Smyrell GS105* (BRI). Gregory North District: Bladensburg N.P., S of Winton, Opalton road, Mar 1998, *Forster PIF22195 & Booth* (BRI, MEL); Raymore – Kyabra road, 60 km NNW of Eromanga, Jan

1998, *Pegler LKP152* (BRI). WARREGO DISTRICT: Idalia N.P., Emmet Pocket, Nov 1990, *Morgan CM35* (BRI); Adavale, Mar 1922, *Graw s.n.* (BRI [AQ230644]).

***Distribution and habitat*:** Widely distributed in central Australia, north of about 28° S latitude, including W.A., N.T., Qld and the far north of S.A. (**Map 7**). It is not known from N.S.W. It grows on a wide range of soil types, often in locations that receive extra water e.g. base of rocky hills, creek banks etc.

***Phenology*:** Flowers are recorded from October to March; fruits from January to May.

***Notes*:** This subspecies differs from subspecies *vespertilio* mainly in leaf shape. The difference is however, so marked, and so well correlated to geographical distribution, that a rank of subspecies is considered to be appropriate. The two subspecies do show some intergradation in leaf form, as evidenced by three specimens at BRI (*Hyland 6149*, *Morgan CM35*, and *Clemens s.n.* [AQ199198]), but the great majority of collections may be readily assigned to one or the other. The seed size also appears to be diagnostic, as for each of the eight seed-bearing specimens at BRI and MEL, the seed length of *Erythrina vespertilio* subsp. *biloba* exceeds that for *E. vespertilio* subsp. *vespertilio*.

***Etymology*:** from the Latin *bi* meaning two and *lobus* meaning lobes. This is a reference to the distinctive leaflet morphology.

4. Erythrina numerosa A.R.Bean **species nova** Species nova affinis *E. vespertilio* sed leguminibus longioribus semina 5–11 continentibus, ovulorum numeris majoribus, caudice laevi unsulcato, floribus in inflorescentia magis dense aggregata, antheris longioribus et corolla pallidiore (aurantiaca usque vitellina) differt. **Typus:** Queensland. MORETON DISTRICT: Splityard Creek, Wivenhoe Dam, 10 February 1991, *L.H. Bird & P.R.Sharpe s.n.* (holo: BRI [AQ547555]; iso: A, CANB, K, MEL, NSW, US, distribuendi).

Erythrina sp. (Croftby P.I.Forster+ PIF6209) in Bostock & Holland (2007).

***Illustrations*:** Nicholson & Nicholson (1991: 26), as *E. vespertilio*; Williams (1979: 110), as *Erythrina* sp.

Tree 5–20 m high, deciduous. Bark smooth, not furrowed, somewhat shiny, creamy, grey, brownish or greenish, with conical corky outgrowths surmounted by prickles. Trunk, branches and terminal branchlets all bearing prickles. Indumentum comprising minute stellate hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green, not waxy below. Petioles unarmed, terete, 45–120 mm long; petiolule of basal leaflets 3.5–7 mm long; terminal leaflet 60–95 mm long, 78–113 mm wide, length/breadth ratio 0.63–1.09, apex obtuse; base obtuse to cuneate; margins sinuate, forming obtuse, tapering, often prominent lateral lobes. Leaflet venation penninerved, either not 3-veined at base or veins converging above base of leaflet. Inflorescences borne on leafless branches, 15–60-flowered, 14–46 cm long, rachis shorter than peduncle, peduncles 3.5–9 mm diameter; fascicles 3-flowered, often two or three fascicles at same position along rachis, each fascicle group 1.5–8 mm apart on rachis, pedicels 9–17 mm long at anthesis; calyx tubular in bud, 17–25 mm long, truncate or with minute lobes, a longitudinal lateral split developing as corolla expands, extending almost to base of calyx; all petals salmon-coloured to orange, prominently veined; standard 39–54 × 21–28 mm, apex obtuse, strongly recurved and exposing staminal column, wings slightly longer than keel, wings 15–18 mm long; keel petals 13–16 mm long, free, obtuse; stamens 35–48 mm long, anthers 2.8–4.3 mm long, yellow to brown; ovary densely stellate hairy, ovules 12–16. Pods strongly curved at maturity, 13–24 cm long, 1.1–1.6 cm wide at widest point, conspicuously narrowed between the seeds, dehiscent when mature with seeds easily visible, glabrous at maturity, surface smooth or striate. Seeds 5–11, ellipsoidal, 9–13 mm long, uniform in colour, orange to red, with a pale hilum. *Pine Mountain coral tree*, *Pine Mountain corkwood*. **Figs 1E, 3**.

***Additional selected specimens examined*: Queensland.** BURNETT DISTRICT: Meandu Mine, Tarong Coal, Feb 1994, *Forster PIF14838 & Smyrell* (BRI). WIDE BAY DISTRICT: Oakview S.F. 220, 2.8 km SSE past barracks, Jul 1990, *Forster PIF6939* (BRI, MEL); 14.1 km from Kenilworth, along Booloumba Creek road, Nov 1990,

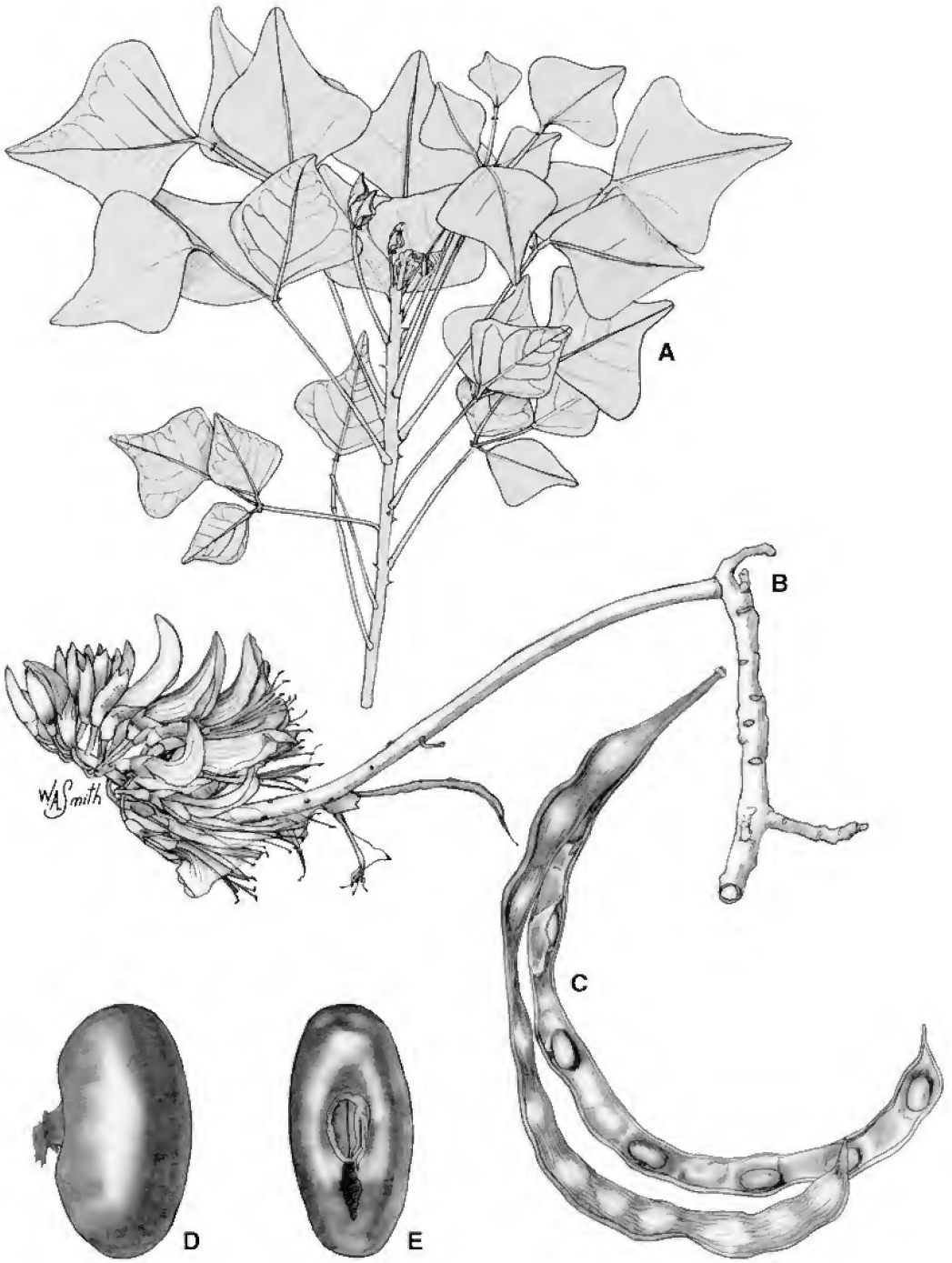

Fig. 4. ***Erythrina numerosa***. A. leafy branchlet × 0.4. B. single inflorescence bearing buds and flowers × 0.4. C. mature fruit containing seeds × 0.5. D, E. seed × 3. A, B from *Forster PIF7618* (BRI); C–E from *Forster PIF7777* (BRI). Del. W. Smith.

Bean 2647 (BRI); Wide Bay, Aug 1843, *Leichhardt s.n.* (MEL). DARLING DOWNS DISTRICT: 2 miles [3 km] S of Maclagan, Nov 1970, *Rawlings s.n.* (BRI [AQ199200]). MORETON DISTRICT: Commissioners View, *c.* 10km E of Blackbutt, Oct 2001, *Bean 17998* (BRI); World's End Pocket at end of Pine Mountain Road, N of Ipswich, Nov 1981, *Bird s.n.* (BRI [AQ347049]); World's End Pocket, Pine Mountain, Nov 1978, *Williams 78249* (BRI); Petrie, 18 miles [29 km] N of Brisbane, Dec 1931, *Blake 3071* (BRI); S.F. 1355 Kipper Creek, Nov 1994, *Forster PIF15888* (BRI); Splityard Creek, Wivenhoe Dam, Nov 1990, *Forster PIF7618 et al.* (BRI); Mt Crosby cliffs, Brisbane River, Feb 1991, *Bird & Collins s.n.* (BRI [AQ547556]); Barnes Hill Pipeline Reserve, Mt Crosby road, Mt Crosby, Oct 1993, *Grimshaw G8 et al.* (BRI); Moggill Scrub, undated, *Stuart 238* (MEL); Brisbane River, Jul 1855, *Mueller s.n.* (MEL); *c.* 2 km NE of Perrys Knob, Mt Marrow area, 4.2 km SSE of Marburg, Oct 1999, *Pollock ABP708 & Leach* (BRI); Neumann's Lookout, 2 km W of Mount Berryman, Feb 1991, *Forster PIF7777* (BRI, MEL); Pimpama, Mar 1889, *Simmonds 115* (BRI); property of A. Schumacher, Milford, SE of Boonah on Rathdowney road, Nov 1981, *Bird s.n.* (BRI [AQ347246]); Boonah – Croftby road, 4.8 km S of Carney's Creek crossing, Oct 2000, *Bean 16908* (BRI). **New South Wales.** NORTH COAST: Acacia Creek, via Killarney, Dec 1905, *Dunn s.n.* (NSW); Mt Warning, Jan 1936, *Fraser s.n.* (NSW); Tyalgum Ridge, Limpinwood Nature Reserve, *c.* 25 km WNW of Murwillumbah, Dec 1977, *Coveny 9932 & Haegi* (BRI, NSW); Bog Onion road, Mebbin S.F., *c.* 7 miles [c. 11 km] S of Tyalgum, Nov 1966, *Hayes 2590 et al.* (NSW); Mt Mullengen, 4 miles [6 km] E of Ramornie, Jul 1922, *Blakely & Shiress s.n.* (NSW).

***Distribution and habitat*:** *Erythrina numerosa* is distributed from Nymboida in New South Wales (Harden *et al.* 2006) to Kilkivan in Queensland (**Map 5**). It grows in araucarian notophyll vine forest or on its margins.

***Phenology*:** Flowers are recorded from October to December; fruits from February to June.

***Notes*:** *Erythrina numerosa* differs from *E. vespertilio* by the peduncles 3.5–8.5 mm diameter (*vs.* 1.5–4.2 for *E. vespertilio*), fascicles 1.5–8 mm apart (*vs.* 8–15), standard petal 39–54 mm long (*vs.* 32–40 mm), keel petals 13.5–15.5 mm long (*vs.* 10–13), anthers 2.8–4.3 mm long (*vs.* 2.1–2.8(–3.1) mm), ovary with 12–16 ovules (*vs.* 6–8), pods 13–24 cm long and containing 5–11 seeds (*vs.* 7–14 cm long and containing 1–4(–5) seeds). In the field, it is conspicuously different by virtue of the smooth, unfurrowed trunk, sometimes rather shiny; in contrast *E. vespertilio* has a dull corky, ridged trunk. The orange to salmon-coloured corolla of *E. numerosa* is markedly paler than that of *E. vespertilio*, in which the corolla is varies from scarlet to orange-red.

***Etymology*:** The epithet refers to the numerous seeds in each pod, in comparison with *Erythrina vespertilio* and other Australian species.

5. *Erythrina caffra Thunb., *Fl. Cap.* Ed. 2, 559 (1823); *Duchassaingia caffra* (Thunb.) Walp., *Linnaea* 23: 741 (1850); *Corallodendron caffrum* (Thunb.) Kuntze, *Revis. Gen. Pl.* 1: 172 (1891). **Type:** South Africa. "e. cap. b. spei Thunberg", *C.P. Thunberg s.n.* (holo: UPS-Thunb. 16302 [microfiche!]).

Tree 6–10 m high, briefly deciduous. Bark mostly smooth, with shallow longitudinal furrows, grey to grey–brown. Trunk and branches bearing large scattered conical prickles, terminal branchlets with prickles. Indumentum comprising minute simple hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green, not waxy below. Petioles unarmed, terete, 50–100 mm long; petiolule of basal leaflets 4–7 mm long; terminal leaflet deltoid, rhomboid or broadly trullate, 55–105 mm long, 50–100 mm wide, length/breadth ratio 1.04–1.31, apex acute to acuminate; base obtuse or truncate; lateral lobes absent; basal leaflets similar but smaller than the terminal one. Leaflet venation penninerved, basal pair of lateral veins converging at point of petiole attachment. Inflorescences borne on leafless branches, 50–100-flowered, 10–18 cm long, rachis usually shorter than peduncle, peduncles 4–5 mm diameter; fascicles 3-flowered, often two or three fascicles at same position along rachis, each fascicle group 3–7 mm apart on rachis, pedicels 5–8 mm long at anthesis; calyx tubular in bud, 9–12 mm long, truncate or with minute lobes, splitting apically as corolla expands, at anthesis shortly bilabiate; all petals orange to scarlet, prominently veined; standard 35–55 × 14–28 mm, apex obtuse, strongly recurved and exposing staminal column, wings and keel similar, wings 13–24 mm long; keel petals 12–21 mm long, fused, obtuse; stamens

38–50 mm long, anthers 2.3–4.3 mm long, yellow to brown; ovary hairy, ovules 8–10. Pods not strongly curved when mature, 6–10 cm long, 0.9–1.2 cm wide at widest point, conspicuously narrowed between the seeds, outer surface smooth, dehiscent, seeds easily visible, glabrous at maturity. Seeds 2–4, ellipsoidal, 6–8 mm long, uniform in colour, red, with a dark hilum. *Kaffir coral tree*. **Fig. 1C**.

***Additional specimens examined*: Queensland.** Moreton District: SW side of Mt Coot-tha, at Chapel Hill Environmental Education Hut, off Fleming road, Sep 1998, *Stephens GBS12* (BRI); Forestry Road, just past lookout, Mt Coot-tha, Sep 1999, *Boyle TPB50 & Lahey* (BRI).

***Distribution and habitat*:** *Erythrina caffra* is sparingly naturalised around Brisbane (**Map 1**), where it has been found on hillsides in woodland dominated by *Eucalyptus* spp. It is also recorded as naturalised on Norfolk Island (Green 1994).

***Phenology*:** Flowers recorded for May and September; fruits in November.

***Notes*:** *Erythrina caffra* originated in South Africa, in coastal forests of the Eastern Cape and KwaZulu-Natal (Hennessey 1991). It has been cultivated in Brisbane since at least 1933 (*White 9026*, BRI).

***Etymology*:** The species name *caffra* refers to Kaffraria, an old name for a part of the Eastern Cape region of Africa.

6. *Erythrina × sykesii Barneby & Krukoff, *Lloydia* 37: 447 (1974). **Type:** Queensland. cultivated at Brisbane Botanic Gardens, 12 June 1933, *C.T.White 9073* (holo: NY; iso: BRI).

Tree 2.5–10 m high, deciduous. Bark mostly smooth, with pale longitudinal fissures, grey to brown. Trunk and branches with prickles, terminal branchlets with or without prickles. Indumentum comprising minute simple hairs, confined to apical section of branchlets, developing leaves and ovaries. Leaves uniformly green, not waxy below. Petioles unarmed, terete, 80–170 mm long; petiolule of basal leaflets 6–10 mm long; terminal leaflet deltoid to rhomboid, 95–180 mm long, 80–230 mm wide, length/breadth ratio 0.78–1.16, apex acuminate or acute; base obtuse to broadly cuneate. Leaflet venation penninerved, basal pair of lateral veins converging at point of petiole attachment (i.e. 3-veined at base). Inflorescences borne on leafless branches, 30–100-flowered, 17–30 cm long, rachis and peduncles about same length, peduncles 4–6 mm diameter; fascicles 3-flowered, often two or three fascicles at same position along rachis, each fascicle group 1–8 mm apart on rachis, pedicels 4–6 mm long at anthesis; calyx tubular in bud, 9–12 mm long, 2-lipped and 14–18 mm long at anthesis; petals red, prominently veined; standard 48–64 × 18–24 mm, apex acute, slightly recurved, staminal column exposed, wings and keel similar, wings 20–28 mm long; keel petals 18–27 mm long, fused to each other for most of their length, obtuse; stamens 55–60 mm long, anthers 2.8–4.5 mm long, yellow; ovary hairy, ovules 11–13. Fruits do not develop. *Thorny coral tree*. **Fig. 2D**.

***Additional specimens examined:* Queensland.** Cook District: Bromfield Crater, Atherton Tableland, Jul 1966, *Brass 33486* (BRI); Egan Creek L.A., SW corner, T.R. 756, Parish of Jordan, Nov 1958, *Smith 10478* (BRI). North Kennedy District: Herberton, north Queensland Tablelands, Feb 2003, *Batianoff 0302118 & Batianoff* (BRI); North Cedar Creek, Ravenshoe, Feb 2003, *Batianoff 0302119 & Batianoff* (BRI). Moreton District: Nambour, Apr 1970, *O'Mara 104* (BRI); Golden Beach Caloundra, Sunshine Coast, Aug 1998, *Batianoff 98083 & Batianoff* (BRI); North Stradbroke Island, Amity Point, Kindaria Street, Aug 2003, *Batianoff 030899 & Boyle* (BRI); Curtis road, Mt Tamborine, Sep 2000, *Bean 16823* (BRI). **New South Wales.** North Coast: Fingal Head, Jul 1998, *Batianoff 980712* (BRI, MEL); Byron Bay, Cape Byron main beach, Jul 1998, *Batianoff 980721* (BRI); Richmond River, Casino, Jul 2004, *Bean 22676* (BRI); Valla, 20 km N of Nambucca Heads and 50 km S of Coffs Harbour, Dec 2004, *Hall s.n.* (BRI [AQ612871]); Woolooware Bay, Cronulla, on Kurnell road, Jul 1976, *Coveny 7753 & Hind* (NSW); ruins of Ellamatta Homestead, Reddells road, *c.* 5 km W of Kembla Grange, Jul 1996, *Jobson 4316* (NSW).

***Distribution and habitat*:** *Erythrina × sykesii* is naturalised in New Zealand (Webb *et al.* 1988) and Australia. In Australia, naturalisations are known from some coastal parts of Qld and N.S.W. (including Lord Howe Island), and around Perth (Paczkowska & Chapman 2000) in W.A. (**Map 9**). It inhabits cleared or disturbed places where the soil is frequently moist, particularly near creeks.

***Phenology*:** Flowers are recorded from July to November.

***Notes*:** The parentage of *Erythrina* × *sykesii* is unknown. Krukoff & Barneby (1974) suggested that the parents could be *E. coralloides* DC. and *E. lysistemon* Hutch. This suggestion was repeated by Spencer (2002). Hennessy (1991) gave *E. speciosa* Andr. and *E. caffra* as the probable parents, and cited morphological features allying it to those species. The origin of *E.* × *sykesii* is also unknown but it has been cultivated for several decades in both Australia and New Zealand (Spencer 2002). It does not produce fruits, but vegetative pieces, even sections of trunk, will sprout roots readily (Esler & Edgar 1997; pers. obs.).

***Etymology*:** Named for W.R. (Bill) Sykes, a New Zealand botanist.

7. *Erythrina crista-galli L., *Mant. Pl.* 99 (1767); *Micropteryx crista-galli* (L.) Walp., *Linnaea* 23: 740 (1840); *Corallodendron crista-galli* (L.) Kuntze, *Revis. Gen. Pl.* 172 (1891). **Type:** Brazil, undated, *D. Vandelli s.n.* (lecto: LINN, Cat. no. 888.4 *fide* Howard (1988)).

***Illustration*:** Whistler & Elevitch (2006: 332).

Evergreen tree 4–8 m high, trunk and branches without prickles, terminal branchlets without prickles. Bark corky, deeply furrowed, grey to brown. Indumentum comprising minute simple hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green, minutely reticulately waxy below. Petioles frequently bearing 1 or 2 recurved prickles, terete, 60–140 mm long; petiolule of basal leaflets 8–13 mm long; terminal leaflet 58–130 mm long, 25–77 mm wide, length/breadth ratio 1.7–2.3, apex acute, base cuneate, lateral lobes absent; basal leaflets identical to, or slightly smaller than the terminal one. Leaflet venation penninerved, without a basal pair of lateral veins. Inflorescences in leaf axils or at end of leafy branchlets, 12–80-flowered, 10–40 cm long, rachis and peduncle not distinguishable; fascicles 2–3- flowered, one or sometimes two fascicles at any position along branchlet, each fascicle (group) 2–32 mm apart on branchlet, pedicels 13–25 mm long at anthesis; calyx broadly campanulate in bud, 9–13 mm long, truncate with two small deciduous teeth, not splitting longitudinally as corolla expands; petals prominently veined; standard pink, red or crimson on inner surface, pink on outer surface, broadly-elliptic, 40–55 × 34–46 mm, apex obtuse or emarginate, strongly recurved and exposing staminal column, wings and keel very dissimilar, wings white, 9–19 mm long, wholly or largely obscured by calyx, obtuse; keel petals pink, red or crimson, 30–45 mm long, fused, incurved, enclosing much of staminal column, acute; stamens 33–55 mm long; anthers 1.9–2.7 mm long, yellow; ovary hairy, ovules 16–21. Pods glabrous at maturity, 14–27 cm long, 1.3–1.6 cm wide at widest point, somewhat narrowed between the seeds, outer surface smooth, pods dehiscent and slightly curved when mature with seeds easily visible. Seeds 2–6, ellipsoidal, 12–16 mm long, not uniform in colour, black with brown streaks, with a pale hilum. *Cockspur coral tree, Cock's comb coral tree.* **Fig. 1D**.

***Additional specimens examined*: Queensland.** Wide Bay District: Tozer Gully, Cootharaba road, Gympie, Nov 2000, *Bean 17044* (BRI). Moreton District: intersection of Rode and Webster roads, Stafford Heights, Nov 1999, *Wrench s.n.* (BRI [AQ665547]); Cannon Hill College, Cannon Hill, 7 km E of Brisbane GPO, Oct 2000, *Bean 16979* (BRI, NSW); Brisbane River, Moggill Ferry Reserve, Sep 2000, *Batianoff 200816* (BRI); Paradise Road, Willawong, *c.* 15 km S of Brisbane CBD, May 2002, *Bean 19028* (BRI); tributary of Blunder Creek, Richlands, Brisbane, Oct 1997, *Hall & Bird s.n.* (BRI [AQ659717]); Greenbank, Brisbane, Nov 1991, *Robins s.n.* (BRI [AQ628572]). **New South Wales.** North Coast: 5 km SW of Lismore, Mar 1984, *Swarbrick 7404* (BRI); Wilson's River floodplain, beside Bruxner Highway, *c.* 3 km SW of Lismore, Oct 1990, *Smith JMBS935* (NSW); Casino, Jan 1991, *Clarke s.n.* (NSW).

***Distribution and habitat*:** *Erythrina crista-galli* is native to Argentina, Brazil, Bolivia, Paraguay and Uruguay (Krukoff & Barneby 1974). It has been widely cultivated in tropical and sub-tropical parts of the world, including South Africa, California (U.S.A.) and Australia. In Australia it has become naturalised in coastal Qld and N.S.W. (**Map 2**) (listed as a noxious weed in the latter state), where it inhabits sunny swampy areas, including areas where the groundwater is brackish.

***Phenology*:** Flowers have been recorded for nearly every month of the year; fruits (rarely collected) recorded in May, November and December.

***Notes*:** This species has been cultivated in Australia since at least 1924 (*White 2400*, BRI). It is the national flower of Argentina (Krukoff & Barneby 1974).

***Etymology*:** The epithet is derived from the Latin, and means 'cock's comb', almost certainly in reference to the linear fan-shaped arrangement of the stamens.

8. Erythrina fusca Lour., *Fl. Cochinch.* 427 (1790); *Corallodendron fuscum* (Lour.) Kuntze, *Revis. Gen. Pl.* 1: 173 (1891). **Types:** Cochinchina, *Louriero s.n.* (syn: not found); illustration of '*Gelala aquatica*' in Rumphius, *Herb. Amboin.*, 2: 235, t. 78 (syn: the illustration).

Evergreen tree to 23 m high. Bark ± smooth, though cracked and with large pustular lenticels, olive-brown. Trunk and branches with or without prickles, terminal branchlets with prickles. Indumentum comprising minute simple hairs, confined to apical section of branchlets, developing leaves, ovaries and young fruits. Leaves uniformly green, not waxy below. Petioles unarmed, terete, 50–100 mm long; petiolule of basal leaflets 7–10 mm long; terminal leaflet 70–120 mm long, 43–76 mm wide, length/breadth ratio 1.58–1.81, apex acute; base obtuse to cuneate; lateral lobes absent; basal leaflets similar but smaller than the terminal one. Leaflet venation penninerved, basal pair of lateral veins converging at point of petiole attachment. Inflorescences borne on leafless branches, 18–30-flowered, 10–26 cm long, rachis and peduncles about same length, peduncles 2.5–4.5 mm diameter; fascicles 3-flowered, each fascicle group 6–25 mm apart on rachis, pedicels 5–13 mm long at anthesis; calyx tubular in bud, 13–16 mm long, truncate or apiculate, a longitudinal split developing as corolla expands, campanulate and asymmetrical at anthesis; all petals prominently veined; standard 38–52 × 25–30 mm, yellow to orange, apex obtuse, strongly recurved and exposing staminal column; wings and keel similar; wings 18–22 mm long, creamy-white proximally, maroon distally; keel petals 20–27 mm long, creamy–white, fused, obtuse; stamens 33–40 mm long, anthers 2.2–3.7 mm long, yellow; ovary hairy, ovule number unknown. Pods glabrous at maturity, 11–20 cm long, 1.2–1.5 cm wide at widest point, slightly narrowed between the seeds, outer surface smooth, pods dehiscent and straight to slightly curved when mature. Seeds 6–12, ellipsoidal, 12–18 mm long, uniform in colour, dark brown. *Coral tree.* **Fig. 2C**.

***Additional specimens examined*: Queensland.** Cook District: Daintree Mission, Sep 1948, *Smith 4036* (BRI); Daintree River, below the township of Daintree, Oct 2000, *Morris s.n.* (BRI [AQ497997]).

***Distribution and habitat*:** *Erythrina fusca* is regarded as the most widespread species of the genus, indigenous to coastal areas of the tropics where annual rainfall is high, including eastern Africa, India, Malesia, many Pacific islands and western South America. In Australia, this species is apparently confined to the Daintree area of north Qld (**Map 3**), where the annual rainfall exceeds 2500 mm and the dominant vegetation type is lowland rainforest.

***Phenology*:** Flowers recorded in September; fruits in October.

***Notes*:** *Erythrina fusca* has not previously been reported as occurring in Australia, despite Smith's collection from the Daintree area in 1948. Apparently it was previously considered that the collection was made from a cultivated specimen. The second collection (cited above) has confirmed the non-cultivated status of *E. fusca* in Australia. However its origin status in Australia (indigenous or alien) remains unclear. Only one tree is currently known to local naturalists.

Drift seeds of *Erythrina fusca* (but not plants) have been recorded from islands of the Capricorn – Bunker group off the coast of Gladstone. These are thought to originate from islands of the Pacific (Smith 1992).

***Etymology*:** From the Latin *fuscus* meaning 'dark, dusky'. This perhaps alludes to the very dark-coloured seeds of this species.

Excluded names

Erythrina acanthocarpa E.Mey.

This species was recorded as perhaps naturalised in South Australia (Jessop & Toelken 1986), but according to R. Barker (pers. comm. 2007), a recent re-examination of the relevant specimen revealed some follow-up documentation to indicate that it was not established.

Erythrina lysistemon Hutch.

Krukoff (1972) identified the leaves of the type collection of *E. phlebocarpa* as belonging to *E. lysistemon*. This is refuted here (see discussion under *E. variegata*). As this was the only non-cultivated record of *E. lysistemon* for Australia, it is excluded from this account.

Acknowledgements

I am grateful to Paul Forster and Ailsa Holland for advice and documentation regarding *Erythrina numerosa,* and Peter Bostock for the Latin diagnosis and distribution maps. Ellen Terrell and Dan Irby sent information about the occurrence of *E. fusca* at Daintree. Will Smith and Brian Connell provided the illustrations.

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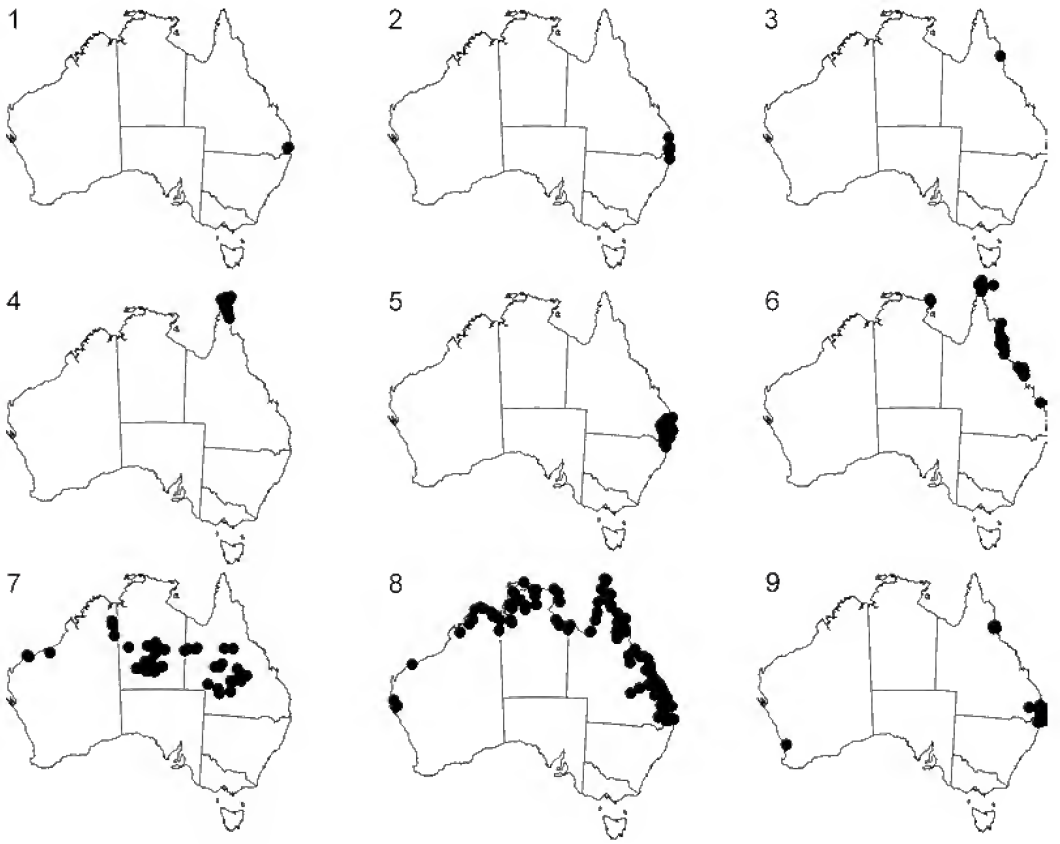

Distribution of *Erythrina* spp. **Maps 1–9**.
Map 1. *E. caffra*. **Map 2**. *E. crista-galli*. **Map 3**. *E. fusca*. **Map 4**. *E. insularis*. **Map 5**. *E. numerosa*. **Map 6**. *E. variegata*. **Map 7**. *E. vespertilio* subsp. *biloba*. **Map 8**. *E. vespertilio* subsp. *vespertilio*. **Map 9**. *E.* × *sykesii*.

A remarkable new species of *Rimularia* Nyl. (lichenized fungi: Trapeliaceae) from tropical Australia

Gintaras Kantvilas[1], Patrick McCarthy[2] & Benjamin Stuckey[3]

Summary

Kantvilas, G., McCarthy, P.M. & Stuckey, B. (2008). A remarkable new species of *Rimularia* Nyl. (lichenized fungi: Trapeliaceae) from tropical Australia. *Austrobaileya* 7(4): 659–663. The new species *Rimularia cerebriformis* Kantvilas is described, based on a collection and field observations from dry eucalypt woodland in the Northern Territory, Australia. It represents an unusual occurrence of a genus that occurs mostly in moist environments in cool to cold, temperate latitudes of both hemispheres. Relationships with other species of the genus are discussed briefly.

Key Words: lichens, *Rimularia cerebriformis*, Trapeliaceae, Northern Territory, Australia

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Introduction

Rimularia Nyl. is a genus of crustose lichens, widespread in cool to cold temperate areas of both hemispheres. General accounts of the genus are provided by Hertel & Rambold (1990) and Lumbsch (1997) and, although many additional species have been described since that time, the delimitation of the genus has remained generally unchanged. It is characterised by the presence of a *Chlorella*-type photobiont, lecideine apothecia with a well-developed, carbonised, cupulate excipulum, branched and anastomosing paraphyses, simple, non-halonate ascospores and, in particular, eight-spored asci of the *Rimularia*-type in the sense of Hertel & Rambold (1990) and Hafellner (1984); that is, with a well-developed tholus with amyloid flanks and an amyloid cap, and generally weakly amyloid internal structures. Species of *Rimularia* occur on rocks, bark, soil, bryophytes and other lichens.

Ten species of *Rimularia* have been recorded for Australia (McCarthy 2007), seven of which are found in Tasmania (Coppins & Kantvilas 2001; Kantvilas & Elix 2007), highlighting the predeliction of the genus for cool, moist environments. Indeed, of the approximately 25 known species in the world, only two, *R. globulispora* from New Guinea (Aptroot & Sipman 1991) and *R. gyromuscosa* from Taiwan (Aptroot & Sparrius 2003) occur in low latitudes. However, both of these are restricted to high elevations; the former is also known from Tasmania (Coppins & Kantvilas 2001). Hence the discovery of a species in tropical Australia, growing on exposed rocks in a lowland, very harsh environment, can be regarded as very unusual. This species is new to science and is described below.

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Materials and methods

The study is based on collections and observations made by the authors, and on comparative material in herbaria, chiefly in the Tasmanian Herbarium (HO). Anatomical and morphological observations were undertaken using light microscopy, with thin hand-cut sections mounted in water, 10% KOH, Lactophenol Cotton Blue, and Lugol's Iodine after pretreatment with KOH (the last indicated as K/I). Ascospore measurements are presented in the format: smallest measurement–*mean*–largest measurement, and are based on 60 observations. Ascus measurements are presented in the same way but, owing to the paucity of material, are based on 20 observations only. Chemical composition was determined by thin-layer chromatography using standard methods (Orange *et al.* 2001).

Taxonomy

Rimularia cerebriformis Kantvilas **species nova** apotheciis intense gyrosis et igitur *Rimulariae gyrizanti R. gyromuscosaeque* optime congruens sed thallo inconspicuo, acidum gyrophoricum continenti, ascosporis 10–19 µm longis, 5–10 µm latis differens. **Typus:** Northern Territory. Edith Falls, 14°12′S, 132°13′E, on exposed sandstone outcrops in river gorge, 22 September 2007, *G.Kantvilas 291/07* (holo: HO; iso: DNA).

Thallus inapparent, very thin and discontinuous. *Photobiont* cells very sparse and limited to the base of the apothecia, *Chlorella*-like, with individual cells globose to rhomboid, mostly 6–8 µm wide, occurring singly or in pairs, surrounded by a gelatinous sheath; colonies of unidentified cyanobacteria also present. *Apothecia* numerous and scattered, 0.5–0.8 mm wide, jet-black, strongly convex to subglobose, broadly adnate at the base, with disc intensely gyrose-contorted and margin indistinct and mostly camouflaged by the gyrae of the disc; in section comprising a mass of amorphous, opaque dark brown, sterile excipular tissue to *c.* 500 µm high, imbedded in the upper part with 'strands' or 'locules' of chiefly colourless hymenial tissue, 60–80 µm high and 50–80 µm wide. *Excipulum* in section K+ olive brownish at the edges, comprising irregularly roundish cells to 10 µm wide. *Hymenium* colourless to pale brownish in the uppermost part, K/I+ pale blue; *asci* eight-spored, broadly clavate, 40–*47.8*–55(–62) × (13–)15–*17.8*–22 µm, of the typical *Rimularia*-type (*sensu* Hafellner 1984); *paraphyses* rather dense, frequently branched and anastomosing, robust, 1–3 µm thick, frequently rather moniliform and of variable thickness; apices neither capitate nor pigmented. *Ascospores* ovate, broadly ellipsoid to oblong, hyaline to occasionally slightly pale brownish, 10–*13.6*–19 × (5–)6–*7.3*–9(–10) µm. *Pyncidia* not observed. **Fig. 1 & 2.**

***Chemistry*:** gyrophoric acid (major) and lecanoric acid (minor) detected by thin-layer chromatography of the apothecia.

***Distribution and habitat*:** The new species is known only from the type locality in the upper reaches of a gorge cut by the Edith River. It grows on coarse, quartz sandstone associated with the Kombolgie Sub Group, formed between 1730 and 1822 mya (Kruse *et al.* 1994). The site is very exposed and, although protected from seasonal burning and floodwaters, may be subject to the microclimatic effects of the waterfall nearby during months of heavy rainfall. Vegetation in the surrounding area included a sparse mix of riparian and lithophytic species including *Xanthostemon eucalyptoides* F.Muell., *Ficus atricha* D.J.Dixon, *Syzigium eucalyptoides* (F.Muell.) B.Hyland subsp. *eucalyptoides, Cymbopogon procerus* R.Br. and species from the broader, low open woodland communities dominated by *Corymbia* K.D.Hill & L.A.S.Johnson, *Eucalyptus* L'Hérit., *Acacia* Mill. and *Triodia* R.Br. The occurrence of lichens at the locality is extremely sporadic. The surfaces of rock exposed to direct sunlight are almost bare, and even *Rimularia cerebriformis* itself appears to be very localised. More sheltered, shaded surfaces, often within clefts or beneath underhangs, are also very poorly colonised, although an unidentified species of *Buellia* was not uncommon.

Leliyn (Edith Falls) is situated in the wet-dry tropics of northern Australia and experiences year round high temperatures. The average maximum and minimum temperatures for Katherine, *c.* 50 km to the south, are 34°C and 20°C respectively; the type locality could expect even higher temperatures. The area receives a majority of its annual rainfall (1282 mm) during heavy monsoonal rains between December and March.

***Notes*:** This species is detected in the field solely by the presence of its jet-black apothecia (**Fig. 1**), and even under low-power magnification, no thallus is visible. Scattered dull olive-brown to olive-green, irregular granules, nestling amongst the coarse grains of the substratum in the vicinity of the apothecia, belong to unidentified cyanobacteria. The degree of penetration of the lichen hyphae into the rock substratum, as determined by discoloration of the latter, appears to be limited to about the outermost 0.5 mm.

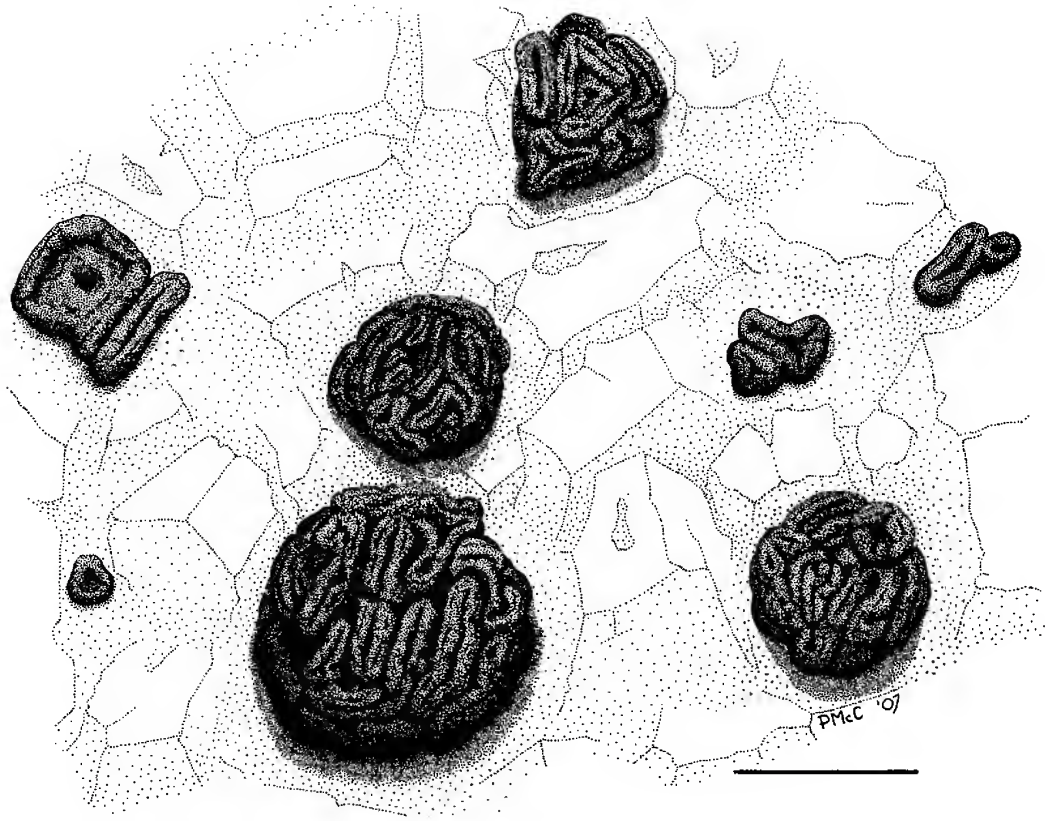

Fig. 1. ***Rimularia cerebriformis*** habit. Scale = 0.5 mm.

The gyrose apothecia of the new species align it to *Rimularia gyrizans* (Nyl.) Hertel & Rambold, which is widespread in cool temperate areas of Europe and North America, to *R. mullensis* (Stirt.) Coppins, endemic to Great Britain, and to *R. gyromuscosa* Aptroot, endemic to subalpine Taiwan. These species differ from *R. cerebriformis* mainly by having a well-developed thallus. There are also chemical differences: the first contains stictic (major) and norstictic (minor) acids, the second contains norstictic acid whereas the last lacks lichen substances. In addition, the ascospores of all of these species are markedly smaller than those of *R. cerebriformis*: 8–11 × 4.7–8 µm in *R. gyrizans* and (6–) 8–11 × 4–7 µm in *R. mullensis* (Hawksworth & Coppins 1992), and 10–12.5 × 5–7 µm in *R. gyromuscosa* (Aptroot & Sparrius 2003).

Amongst the Australian species of *Rimularia*, *Rimularia cerebriformis* is easily distinguished by its gyrose apothecia. There is one taxon of as yet undetermined identity in alpine Tasmania that has similar apothecia, but this has a well-developed thallus containing norstictic acid. Gyrophoric acid is a relatively common substance in *Rimularia*, and amongst the Australian species, is also known from *R. australis* Hertel & Rambold, *R. exigua* Hertel & Rambold, *R. insularis* (Nyl.) Rambold & Hertel and *R. ramboldiana* Kantvilas & Elix; none of these species could in any way be confused with *R. cerebriformis*. Indeed the most superficially similar lichen known to us is *Stephanocyclos henssenianus* Hertel, a predominantly subantarctic, saxicolous lichen also known from Tasmania. That species lacks a conspicuous thallus and has prominent, subglobose, gyrose apothecia. However, it also has unequivocally *Porpidia*-type asci and belongs in the Porpidiaceae.

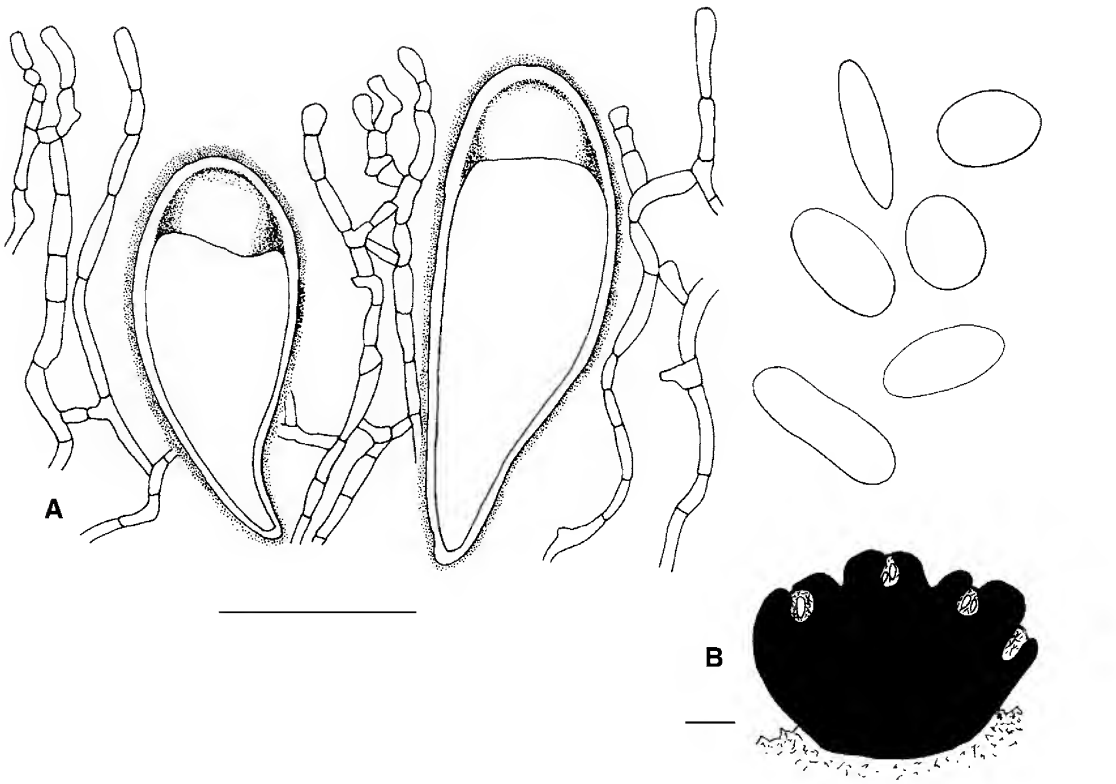

Fig. 2. ***Rimularia cerebriformis*** anatomy. A. asci, paraphyses and ascospores, with amyloid tissues stippled. Scale =20 µm. B. vertical section through apothecium (schematic), showing carbonised, massive excipulum and 'locules' of hymenial tissue. Scale = 100 µm.

Acknowledgements

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A new subsection and two new subseries for *Boronia* Sm. section *Valvatae* (Benth.) Engl. (Rutaceae)

Marco F. Duretto

Summary

Duretto, M.F. (2008). A new subsection and two new subseries for *Boronia* Sm. section *Valvatae* (Benth.) Engl. (Rutaceae). *Austrobaileya* 7(4): 665–668. Three infrageneric taxa are newly described for *Boronia* Sm. section *Valvatae* (Benth.) Engl.: these being *B.* subsection *Anomalae* Duretto, and *B.* subseries *Lanceolatae* Duretto and *B.* subseries *Rosmarinifoliae* Duretto of *B.* series *Valvatae*. Descriptions and notes on the distribution and species composition of each new taxon and *B.* subseries *Valvatae* are provided.

Key Words: Rutaceae, *Boronia*, *Boronia* section *Valvatae*, *Boronia* subsection *Anomalae*, *Boronia* series *Valvatae*, *Boronia* subseries *Valvatae*, *Boronia* subseries *Lanceolatae*, *Boronia* subseries *Rosmarinifoliae*

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Introduction

Boronia Sm. section *Valvatae* (Benth.) Engl. *sensu lato* was the subject of cladistic analyses using morphological and anatomical characters that resulted in the publication of the first infrageneric classification for the section (Duretto & Ladiges 1999; Duretto 1999). In those studies a number of taxonomic issues were identified and some taxa were treated as *incertae sedis* and a number of species and species-groups were informally identified. In anticipation of the *Flora of Australia* account of the genus these informal taxa are being formally described, where appropriate, or placed in synonomy (see also Duretto accepted), and the position of one of the taxa treated as *incertae sedis* is resolved.

Boronia anomala Duretto was treated as *incertae sedis* in *B.* section *Valvatae* as its taxonomic relationships with the four formally recognised subsections were unclear (Duretto 1999). A new subsection is described here to accommodate it. The main reason for describing a new subsection for this species is to have the formal taxonomy reflect the current understanding of the relationships of species in the section. *Boronia anomala* is an unusual species and though it appears to be more closely related to *B.* subsection *Grandisepalae* Duretto (NW Australia) this is not certain (Duretto 1999) and requires further investigation. The current formal classification of *B.* section *Valvatae* will now reflect current understanding of the group and taxonomically isolated taxa should be easily identifiable by being members of higher taxonomic taxa, in this case a subsection. Species that are the sole representatives of higher taxonomic groups have a high conservation value (see Humphries *et al.* 1995) and this information is more easily extracted from a formal classification than it is from informal and/or uncertain ones. The formal description of an infrageneric taxon to accommodate *B. anomala* will hopefully prompt further research on this species.

One of the larger clades identified by Duretto & Ladiges (1999) and Duretto (1999) was *Boronia* series *Valvatae* which contains 24 species. Support for the nodes within *B.* series *Valvatae* was weak and the entire clade was susceptible to collapse if taxa and/or characters were deleted and/or added to the cladistic dataset (Duretto & Ladiges 1999; Duretto 1999; Duretto *et al.* 2004). With this in mind, a cautious approach was adopted and the four main clades in *B.* series *Valvatae* were treated as informal species-groups: *viz.* the *B. alulata* species-group, the *B. foetida* species-group, the *B. lanceolata* species-

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group and the *B. rosmarinifolia* species-group (Duretto & Ladiges 1999; Duretto 1999). These groups remained stable in later analyses with the addition of new taxa (Duretto 2003; Duretto *et al.* 2004). The *B. foetida* and the *B. lanceolata* species-groups, with additional collections and a re-evaluation of their morphological descriptions, have proved to be indistinguishable and are thus combined.

These three informal species-groups are here formally described as subseries. This is being done firstly, because they are higher taxa worthy of formal recognition and in hindsight the approach adopted in 1999 was overly cautious, and secondly, a formal taxonomy is more stable and of greater value compared to an informal classification which can become problematic in the long term and invariably does not become adopted. The *Boronia alulata* species-group contains the type species of *B.* section *Valvatae*, *B. alulata* Sol. ex Benth., and becomes *B.* subseries *Valvatae*.

Three species in *Boronia* series *Valvatae*, *B. chartacea* P.H.Weston, *B. hapalophylla* Duretto, F.J.Edwards & P.G.Edwards, and *B. ledifolia* (Vent.) DC., fall outside these new subseries and are treated as *incertae sedis* (Duretto & Ladiges 1999; Duretto 1999; Duretto *et al.* 2004). Further research using additional data (especially molecular) is required to elucidate relationships of these taxa.

Taxonomy

Boronia section **Valvatae** (Benth.) Engl., *Nat. Pflanzen.* 3(4): 135 (1896); *Boronia* series *Valvatae* Benth., *Fl. Austral.* 1: 308, 311 (1863).

Type species: *Boronia alulata* Benth., *fide* Duretto (1999: 56).

The section is classified into five subsections: subsection *Anomalae* Duretto (described below, northern Western Australia (N WA)), subsection *Bowmaniorum* Duretto (Cape York, northern Queensland (Qld)), subsection *Grandisepalae* Duretto (N WA, Northern Territory (NT), north-west Qld), subsection *Ternatae* Duretto (south-western WA) and subsection *Valvatae* (NT, Qld, New South Wales (NSW), Victoria) (see Duretto 1999 for full descriptions).

Boronia subsection **Anomalae** Duretto, **subsectio nova** a subsectione typica pilis non stellatis, petalis caducis, filamentis staminum clavatis, antheris antipetalis multo longioribus quam antheris antisepalis differt.

Type species: *Boronia anomala* Duretto

Glabrous except for adaxial surface of petals and staminal filaments; stellate hairs absent. Branches with decurrent leaf bases. Leaves imparipinnate; rhachis segments linear; lamina dorsiventral, epicuticular wax platelets absent; midrib impressed on the adaxial surface, not raised on the abaxial surface, with tightly packed tissue between midvein and abaxial epidermis. Inflorescence 1–3-flowered, axillary. Sepals much smaller than petals [aestivation unknown], persistent with fruit. Petals without a raised midrib abaxially, valvate in bud, caducous with fruit. Stamens: filaments clavate, suddenly narrowing at apex so as to appear truncated before connecting to anther, pilose along the margins below the glandular tip; anthers attached to the apex of the filament; antipetalous anthers much larger than antisepalous anthers; anther-apiculum minute. Seed (mature not seen) black, shiny, possibly slightly rugulose, adaxial side flattened and without ridge.

***Notes*:** *Boronia* subsection *Anomalae* is distinguished from the four other subsections of *B.* section *Valvatae* by the lack of stellate hairs and the deciduous petals. The presence of stellate hairs and persistent petals are apomorphies for *B.* section *Valvatae* (less *B. anomala*) (Duretto & Ladiges 1999; Duretto 1999). Other apomorphies for the section are the axillary inflorescences and the sepals and petals being valvate in bud. *Boronia anomala* has these features apart from the sepal aestivation character which is unknown for the species. Sepal aestivation and mature seed morphology are key characters in the classification of *Boronia* and both are unknown for *B. anomala*. The seed possibly being slightly rugulose is interesting as in *Boronia* this feature only

occurs elsewhere in *B.* sections *Imbricatae* Engler and *Cyanothamnus* (Lindl.) F.Muell. Together with *B.* subsection *Grandisepalae*, which is also confined to north-western Australia, *B. anomala* shares the pinched staminal filaments and relatively large antepetalous anthers but lacks the large sepals characteristic of *B.* subsection *Grandisepalae*. In the analysis described by Duretto (1999), where the sepal aestivation was scored as 'unknown', *B. anomala* was sister to *B.* subsection *Grandisepalae* in 80% of the found trees and to either *B.* subsection *Valvatae* or *B.* subsection *Bowmaniorum* in the remaining trees. In these cases it would appear that the lack of stellate hairs and deciduous petals are secondary losses for the species.

It is worth noting that geographically restricted and taxonomically isolated subgeneric taxa in *Boronia* with large numbers of autapomorphies are not unusual in north-western Australia: see also *B.* series *Quadrilatae* Duretto and *B.* series *Rupicola* Duretto (Duretto & Ladiges 1999; Duretto 1999, accepted).

The subsection is monotypic and confined to the Kimberley Region of northern Western Australia (see Duretto 1999 for additional information on *Boronia anomala*).

Boronia series **Valvatae**

A series of four subseries (see below) that contain 21 species, plus an additional three species, *Boronia chartacea*, *B. hapalophylla* and *B. ledifolia*, that are treated as *incertae sedis* (see above). Full descriptions, keys to taxa and notes on all but two species are given by Duretto (1999). *Boronia beeronensis* Duretto and *B. hapalophylla* are discussed in full by Duretto (2003) and Duretto *et al.* (2004) respectively.

Boronia subseries **Valvatae**

Boronia alulata species-group, *fide* Duretto, (1999: 63)

Leaves petiolate, imparipinnate, the younger distal leaves not unifoliolate; leaflets linear to broadly elliptic to spathulate, obtuse to acute, margins slightly recurved to revolute, midribs impressed on the adaxial surface, raised on the abaxial surface, the cells between midvein and abaxial epidermis with secondary thickening. Inflorescence 1-many flowered. Sepals narrowly ovate-deltate to narrowly deltate (except *B. umbellata*), acute; abaxial surface with a moderately dense indumentum, often dark in colour.

***Notes*:** *Boronia* subseries *Valvatae* is characterised by the following combination of characters: imparipinnate leaves that have raised midribs with secondary thickening on the abaxial surface, and the narrowly deltate sepals. *Boronia umbellata* P.H.Weston does not have narrowly deltate sepals but is the sister species of *B. mollis* A.Cunn. ex Lindl. (Duretto & Ladiges 1999; Duretto 1999) and the lack of the narrowly deltate sepals appears to be a secondary loss.

Boronia subseries *Valvatae* contains eight species (*B. alulata, B. amabilis* S.T.Blake, *B. angustisepala* Duretto, *B. hoipolloi* Duretto, *B. mollis, B. obovata* C.T.White, *B. quinkanesis* Duretto, *B. umbellata*) found from Cape York (N Qld) to the Sydney region (NSW) and in north-western Queensand (Fig. 10 in Duretto 1999).

Boronia subseries **Lanceolatae** Duretto, **subseries nova** a subserie typica sepalis late deltatis abaxialiter dense tomentosis, ad apicem acuminatis usque acutis differt.

Type species: *Boronia lanceolata* F.Muell.

Boronia lanceolata species-group, *fide* Duretto, *Muelleria* (1999: 74)

Boronia foetida species-group, *fide* Duretto, *Muelleria* (1999: 84)

Leaves petiolate, imparipinnate or simple, leaves often becoming simple distally; leaflets or simple leaves narrowly to broadly elliptic, acute, the margins plane to slightly recurved (sometimes revolute on drying); midrib impressed on the adaxial surface, raised prominently on the abaxial surface, the cells between midvein and abaxial epidermis with secondary thickening. Inflorescence 1-many-flowered. Sepals broadly deltate, acuminate to acute, abaxial surface with a dense, fawn stellate indumentum.

***Notes*:** *Boronia* subseries *Lanceolatae* is characterised by the presence of ovate-deltate sepals, and petiolate leaves that have prominently raised midribs with secondary thickening. All species have large simple leaves except *B. duiganiae* Duretto which usually has pinnate leaves, and *B. odorata* Duretto which sometimes has juvenile leaves that are trifoliolate.

Boronia subseries *Lanceolatae* contains seven species (*B. bella* Duretto, *B. duiganiae*, *B. excelsa* Duretto, *B. foetida* Duretto, *B. jensziae* Duretto, *B. lanceolata*, *B. odorata*) and is found in the 'Top End' of the Northern Territory and eastern Queensland (Figs 11 & 13 in Duretto 1999).

Boronia subseries **Rosmarinifoliae** Duretto, **subseries nova** a subserie typica foliis simplicibus sessilibus, cellulis costae abaxialis sine densatione secundaria differt.

Type species: *Boronia rosmarinifolia* A.Cunn. ex Endl.

Boronia rosmarinifolia species-group, *fide* Duretto (1999: 78)

Leaves sessile, simple, linear to elliptic to obovate, obtuse, margin plane to revolute; midvein impressed slightly on the adaxial surface, raised slightly on the abaxial surface, the cells between the midvein and the abaxial epidermis without secondary thickening. Inflorescence 1(–3)-flowered. Sepals ovate-deltate, acute to acuminate, abaxial surface with a dense fawn indumentum.

***Notes*:** *Boronia* subseries *Rosmarinifoliae* is characterised by small, sessile, simple leaves without secondary thickening in the cells of the abaxial midrib.

Boronia subseries *Rosmarinifoliae* contains six species (*B. beeronensis*, *B. forsteri* Duretto, *B. glabra* (Maiden & Betche) Cheel, *B. palasepala* Duretto, *B. rosmarinifolia*, *B. splendida* Duretto) and is found in south-eastern Queensland and north-eastern New South Wales (Fig. 12 in Duretto 1999; Fig. 15 in Duretto 2003).

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Solanum succosum A.R.Bean & Albr. (Solanaceae), a new species allied to *S. chippendalei* Symon

A.R.Bean[1] & D.E.Albrecht[2]

Summary

Bean, A.R. & Albrecht, D.E. (2008). *Solanum succosum* A.R.Bean & Albr. (Solanaceae), a new species allied to *S. chippendalei* Symon. *Austrobaileya* 7(4): 669–675. The new species, *Solanum succosum* from Queensland and the Northern Territory, is described and illustrated. It is closely allied to *S. chippendalei* for which a comparative description is provided. Distribution maps are presented for both species and *S. succosum* is illustrated.

Key Words: *Solanum succosum, Solanum chippendalei*, Solanaceae, taxonomy, Australian flora, identification

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Introduction

In his revision of Australian *Solanum*, Symon (1981) identified a group of closely related species (*S. melanospermum* F.Muell., *S. chippendalei* Symon, *S. phlomoides* A.Cunn. ex Benth. and *S. beaugleholei* Symon), which he termed a "quartet of species with common ancestry". He did not outline the distinguishing features of the group, but these species may be characterised by the strongly andromonoecious inflorescences (one bisexual flower at the base and numerous male flowers above), the calyx not accrescent (although the calyx lobes may be almost as long as the mature fruit), the black seeds, and the fruits 21–40 mm diameter (among the largest for *Solanum* spp. in Australia).

Solanum chippendalei sensu Symon, extends from the eastern Pilbara region in Western Australia to Winton in northwest Queensland, in semi-arid hummock grassland and shrubland to woodland habitats. Field and herbarium observations by the authors indicate Symon's concept of *S. chippendalei* comprises two species: *S. chippendalei* and *S. succosum* A.R.Bean & Albr., here described as new.

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Materials and methods

The present study is based on herbarium specimens at BRI (including material in spirit), CANB, DNA, NT, MEL and PERTH as well as field studies by the authors in Queensland (Qld), southern Northern Territory (NT) and the Pilbara region of Western Australia (WA).

The species descriptions and terminology presented in this paper follow those of Bean (2004) and all data gathered during this study have been added to an existing DELTA (Dallwitz *et al.* 1993) dataset. An interactive key covering *Solanum* spp. of eastern Australia is available at the DELTA website (http://delta–intkey.com/).

Prickle width is measured just above the base of the prickle, where the prickle surface is at 45° to the branch. The prickle length is the distance from this position to the apex of the prickle. Adult leaves are those adjacent to, or distal from, the inflorescences.

Taxonomy

Solanum succosum A.R.Bean & Albr. **species nova** affine *S. chippendalei* sed a quo foliis inferioribus profunde lobatis, filamentis multo longioribus dorsifixis, seminibus minoribus, et fructibus persistentibus cavitate interna liquido impleta et pericarpio tenuiore praeditis, differens. **Typus:** Queensland. Burke District: *c.* 8 km along road to Lady

Loretta Mine, turnoff *c.* 65 km from Mt Isa, 24 August 1993, *T.R.Lally 101* (holo: BRI; iso: CANB, DNA).

Solanum sp. Juicy Fruit (P.K.Latz 18938) in Albrecht *et al.* (2007).

***Illustration*:** Symon (1981: 273), as *Solanum chippendalei*.

Erect, rhizomatous perennial shrub 0.4–1.5 m high. Adult branchlets terete or ridged, white, grey, yellow, rusty or brown; prickles 3.5–40 per cm, straight, acicular, 1–10 (–13) mm long, 7–16 times longer than wide, with dense stellate hairs on lower part; stellate hairs very dense, 0.7–1.3 (–1.6) mm diameter, stalks 0–1.6 (–2) mm long, lateral rays 7–8, porrect or ascending; central ray 1–1.5 times as long as laterals, not gland tipped. Adult leaves lanceolate, elliptical or ovate, shallowly or deeply lobed throughout, lobes 2–4 on each side, obtuse, lobing index 1.2–5, at least the lower leaves always deeply lobed; lamina 3–12 cm long, 1.4–5.3 (–8) cm wide, 1.6–3.5 times longer than broad; apex obtuse or acute; base cuneate or obtuse; oblique part 0–11 mm long, obliqueness index 0–10 percent; petioles 0.8–2.1 cm long, 20–30% length of lamina, prickles present. Upper leaf surface grey-green or grey, prickles 0–8, straight, acicular or broad-based, 3–10 mm long; stellate hairs distributed throughout, stellate hairs dense to very dense, 0.15–0.3 mm apart, 0.5–1 mm across, stalks 0–0.5 mm long; lateral rays 6–9, porrect or ascending; central ray 1–2.5 times as long as laterals, not gland–tipped; simple hairs absent; Type 2 hairs absent. Lower leaf surface grey, white, or yellowish, prickles 0–5, straight, acicular or broad-based; stellate hairs dense to very dense, 0.1–0.2 mm apart, 0.7–1.5 mm diameter, stalks 0–0.8 mm long; lateral rays 6–8, porrect; central ray 1–1.8 times as long as laterals, not gland tipped; simple hairs absent; Type 2 hairs absent. Inflorescence supra-axillary, cymose (pseudo-racemose), common peduncle 0–3 mm long, rhachis prickles present, 7–11-flowered, with one usually markedly larger bisexual flower, the rest male. Pedicels at anthesis 5–23 mm long, prickles absent or present. Calyx prickles on basal bisexual flower 35–125, each 2–6 mm long; calyx prickles on distal male flowers 0–15, each 1–5 mm long; calyx tube at anthesis 3–5 mm long, lobes attenuate, 6.5–11 mm long. Calyx stellate hairs very dense, white, 0.7–0.9 mm across, stalks 0–1.5 mm long, lateral rays 7–8; central ray 1–1.5 times as long as laterals, not gland tipped; simple hairs absent; Type 2 hairs absent. Corolla purple, 10–33 mm long, rotate, inner surface glabrous or rarely with a few stellate hairs at tip of lobes. Anthers 5.8–8 mm long, dorsifixed towards base. Filaments (1.6–) 2–3.3 mm long. Ovary glabrous. Functional style glabrous, 10–12.5 mm long, erect near base, then bent, displacing one anther. Fruiting calyx lobes less than or more than half length of mature fruit, lobes not recurved or strongly recurved; prickles 2–6 mm long. Fruits 1 per inflorescence, broadly ellipsoidal or less commonly globular, 21–30 mm diameter at maturity, yellow or yellowish-green, eventually turning very dark brown and prune-like, 2-locular, placenta stalked, anvil-shaped, extending the length of fruit; pericarp initially 1.5–4 mm thick, the innermost surface gelatinous and gradually deliquescing, finally 1–1.5 mm thick; internal cavity of fruit fluid–filled when fruits green or yellow. Pedicels at fruiting stage 20–55 mm long, 1.3–2.5 mm thick at midpoint. Seeds black, flattened, 3–4 mm long, 2.7–3.2 mm wide. **Fig. 1.**

***Additional selected specimens examined*: Queensland.** Gregory North District: 47.8 km from Dajarra, towards Mt Isa, May 2005, *Bean 23697* (BRI, UT); Trough Tank, Placer Pacific Osborne exploration lease, 31km N of Pathungra, May 1993, *Gunness AG2187* (BRI); 70 miles [113 km] W of Winton on Boulia road, May 1966, *Pedley 2000* (BRI); 15 km NE of 'Burnham', Jun 1979, *Purdie 1551* (BRI). Burke District: Mt Isa, Nov 1930, *MacCallum s.n.* (BRI); 3.9 km by road along Gunpowder road from junction with highway, Jun 2004, *McDonald KRM2861* (BRI); Camooweal Caves N.P., Apr 2001, *McDonald KRM849* (BRI); Corella River, 88 km W of Cloncurry on road to Mt Isa, Jul 2003, *McKenzie RAM03/77* (BRI). **Northern Territory.** Burt Plain: 15 miles [24 km] N of Alice Springs, May 1968, *Nelson 1698* (MEL, NT). Darwin Coastal: 2 miles [3 km] E Howard Creek on Koolpinya road, Jan 1964, *Robinson 236* (DNA). Davenport Murchison Range: 3.5 km N of Whistleduck Creek camping area, Davenport Range N.P., May 2005, *Bean 23802* (BRI, UT); near Dixon Creek, N of Devils Marbles, May 2005, *Bean 23832* (BRI, UT); 13.2km S of Renner Springs, Jun 2005, *Bean 24167* (BRI, NY, UT). Mitchell Grass Downs: 18 miles [29 km] S of Elliot, Feb 1969, *Latz 426* (NT). Ord–Victoria Plains: Mt Sanford, Aug 2000, *Brock 124* (B, NT); Humbert River Station, Jun 1974, *Latz 5324* (AD, MO, NT). Sturt Plateau: 3.5

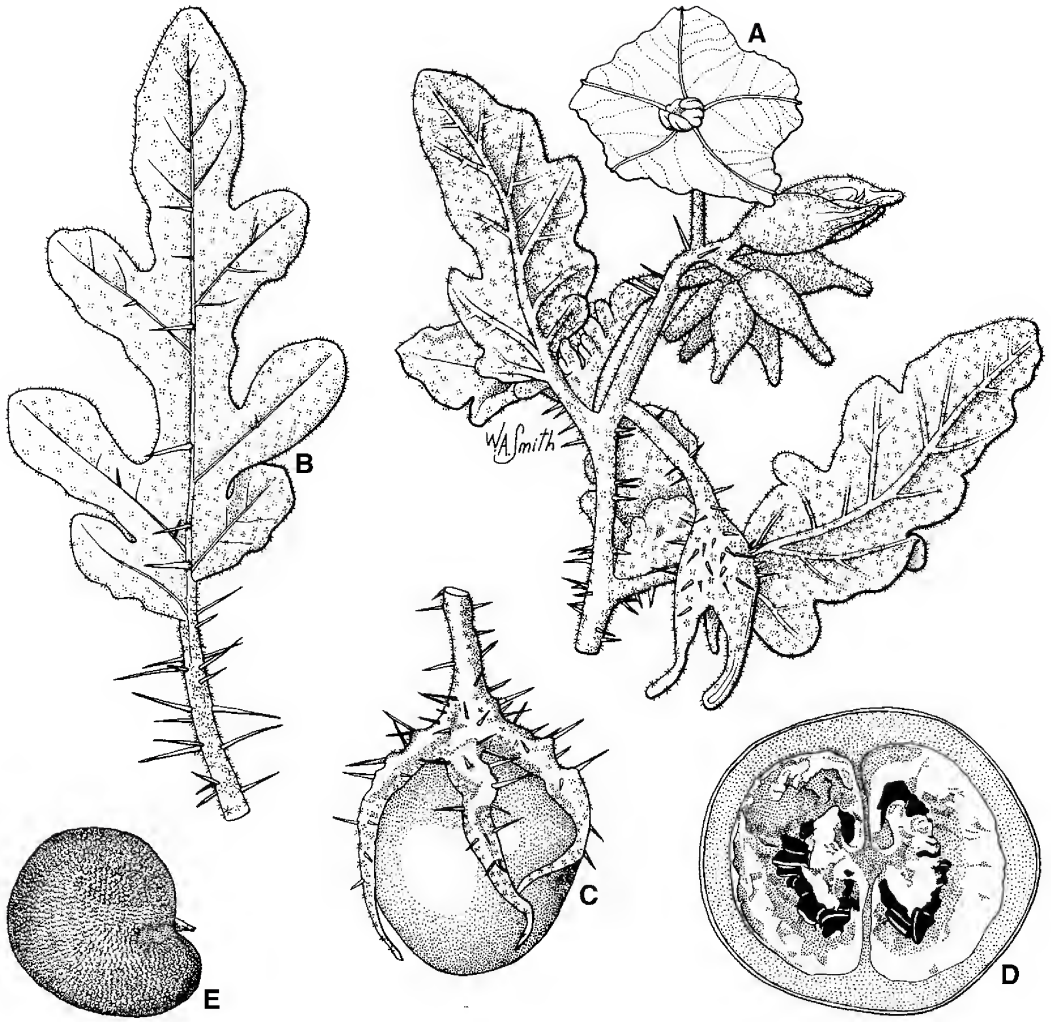

Fig. 1. ***Solanum succosum.*** A. flowering branchlet × 1. B. adult leaf × 1. C. calyx and fruit, close to maturity × 1. D. transverse section of fruit × 1.5. E. seed × 8. A from *McDonald KRM862* (BRI); B from *Bean 23802* (BRI); C–E from *McDonald KRM856* (BRI). Del. W. Smith.

km S of Three Ways, towards Tennant Creek, Apr 2001, *McDonald KRM856* (BRI); N of Renner Springs, Apr 2001, *McDonald KRM862* (BRI); 16 km S of Larrimah, Jun 1972, *Symon 7639* (AD, B, NSW, NT); 1 km N of Larrimah, Jun 1975, *Symon 10353* (AD, CANB, MO, NT). TANAMI: 7 miles S of Tennant Creek town, Mar 1955, *Chippendale 956* (CANB, DNA, MEL, NT, S); 27 km S of Tennant Creek, July 1977, *Latz 7419* (AD, NT); Newcastle Waters, 1887, *Giles s.n.* (MEL).

***Distribution and habitat*:** *Solanum succosum* is found in summer rainfall dominated semi-arid and monsoonal parts of northwest Qld (from Lawn Hill National Park to Winton) and north central to northwest NT (from about Humbert River Station in the northwest to as far south as about Wauchope). Two specimens (just north of Alice Springs on the verge of the Stuart Highway, and east of Howard Creek in the Darwin Coast bioregion) are distant from the main range of the species (**Map 2**). The former occurrence is undoubtedly due to human influence but the status of the latter is equivocal. Most records of the species are from *Triodia* dominated habitats on gravelly hillslopes, and gravelly or sandy plains and creeklines. A few records have been made from along tracks through Mitchell grass

country on clay plains. Germination of seeds and clonal regrowth are both evident after fire.

***Phenology*:** This species may flower and fruit at any time of year, generally in response to a fire or rainfall event.

***Notes*:** *Solanum succosum* is closely allied to *S. chippendalei* but differs in a number of respects. In *S. succosum*, the lower leaves (and often all leaves) are deeply lobed (not entire or shallowly lobed), the anthers are dorsifixed (not basifixed), the filaments are (1.6–) 2.0–3.3 mm long (compared to 5–7 mm long). The mature fruits are mostly longer than broad (although sometimes globular), have liquid-filled internal cavity, the pericarp is initially 1.5–3 mm thick, becoming thinner with age, and the placenta is longitudinally continuous. The fruits are very firmly attached to the calyx, and detached only with difficulty, then leaving a conical plug on the calyx. Fruits detached in this manner invariably exhibit two pores near the end of the fruit through which juice and seeds may be squirted. The seeds are 3–4 mm long and 2.7–3.2 mm wide, the lower leaf surface has stellate hairs 0.7–1.6 mm diameter, and stellate hairs on branchlets are 0.8–1.3 mm diameter.

By contrast, in *Solanum chippendalei* the leaves have shallow lobes throughout, or are (frequently) entire. The filaments are 0.5–1.5 mm long and basally attached; the mature fruits are globular, lack liquid in the internal cavity, the pericarp is 4–7.5 mm thick, not becoming thinner with age, and the placenta does not extend to the distal end of the fruit. The fruits are not firmly attached to the calyx, and mature fruits may often be seen lying on the ground after falling from the plant. The scar on the fruiting calyx is flat and circular. Detached fruits never exhibit pores. Seeds are (3.2–) 3.7–5 (–5.3) mm long and (2.5–) 2.8–4 (–4.6) mm wide, the lower leaf surface has stellate hairs 0.5–1 mm diameter, and stellate hairs on branchlets are 0.4–1 mm diameter.

***Ethnobotany*:** Kaytetye and Anmatyerr peoples recognise *Solanum succosum* as distinct from *S.chippendalei*. Both language groups use the name *tyatyarlkwerre* for *S. succosum* and regard the fruit as inedible, one woman saying they are poisonous (Myf Turpin, pers. comm. 2007). Anmatyerr people use the names *anakety* or *antyewal* for *S. chippendalei* and regard the fruit highly (Latz 1995).

***Etymology*:** From the Latin *succosus* meaning 'juicy'. This refers to the liquid-filled internal cavity of mature fruits of this species, which contrasts strongly with the dry internal cavity of the related *Solanum chippendalei*.

Solanum chippendalei Symon, *J. Adelaide Bot. Gard.* 4: 272 (1981). **Type:** Western Australia. base of the Sir Frederick Range, 1 August 1962, *D.E.Symon 2272* (holo: AD; iso: AD, CANB, PERTH).

***Illustrations*:** Symon (1981: 267, fig. 119); Latz (1995: 271–272).

Erect, rhizomatous perennial shrub, 0.25–1.5 m high. Adult branchlets white, grey, yellow, rusty or brown; prickles 4–26 per cm, straight, acicular, 2.5–8 mm long, 8–17 times longer than wide, with scattered stellate hairs on lower part. Adult branchlets with stellate hairs very dense, 0.4–1 mm diameter, stalks up to 0.8 mm long, lateral rays 7–9, porrect or ascending; central ray 0.7–1.6 times as long as laterals, not gland tipped. Adult leaves lanceolate, elliptical or ovate, entire or shallowly lobed throughout, lobes when present 3–5 on each side, obtuse, lobing index 1–2; lamina 3–13.2 cm long, 1.6–5.1 cm wide, 1.5–3.3 times longer than broad; apex obtuse or acute; base cuneate or obtuse; oblique part 2–12 mm long, obliqueness index 2–11 percent; petioles 1.2–4.3 cm long, 16–38% length of lamina, prickles present. Upper leaf surface grey-green or grey, prickles 0–4, straight, acicular, 2–4 (–8) mm long; stellate hairs distributed throughout, stellate hairs dense to very dense, 0.05–0.25 (–0.3) mm apart, 0.5–0.9 (–1.2) mm across, stalks 0.1–0.5 (–0.7) mm long; lateral rays 7–8, porrect; central ray 0.8–1.5 times as long as laterals, not gland tipped; simple hairs absent; Type 2 hairs absent. Lower leaf surface white, to yellowish, prickles 0–5 (–10), straight, acicular; stellate hairs very dense, 0.05–0.2 (–0.25) mm apart, 0.5–1 mm diameter, stalks 0.1–0.7 (–1) mm long; lateral rays 7–8, porrect; central ray 0.7–1.5 times as long as laterals, not gland tipped;

simple hairs absent; Type 2 hairs absent. Inflorescence leaf-opposed or supra-axillary, cymose, common peduncle up to 33 mm long, rhachis prickles absent or present, 8–30-flowered, with one bisexual flower, the rest male. Flowers 5-merous, markedly dimorphic, with a larger pricklier basal flower. Pedicels at anthesis 5–27 mm long, prickles absent or present. Calyx prickles on basal bisexual flower 70–130, each 2–9 mm long; calyx prickles on distal male flowers 0–12, each 2–4.5 mm long; calyx tube at anthesis 2–6 mm long, lobes deltate to attenuate, 8–21 mm long. Calyx stellae very dense, white, 0.5–0.8 mm across, stalks 0–0.8 mm long, lateral rays 7–9; central ray 1–1.5 times as long as laterals, not gland tipped; simple hairs absent; Type 2 hairs absent. Corolla purple, 7–28 mm long, rotate or shallowly lobed, inner surface glabrous or sparsely stellate-hairy. Anthers 5–7 mm long, basifixed. Filaments 0.5–1.5 mm long. Ovary glabrous or with stellate hairs. Functional style glabrous, 12–13 mm long, erect near base, then bent, displacing one anther. Fruiting calyx lobes more than half length of mature fruit, lobes not recurved or rarely strongly recurved; prickles 1–7 mm long. Fruits 1 per inflorescence, globular to obloid, 23–40 mm diameter at maturity, yellow or yellowish-green, 2-locular, placenta not apparent at distal end, pericarp 4–7.5 mm thick, not deliquescing; internal cavity of fruit not fluid-filled. Pedicels at fruiting stage 15–50 mm long, 1.5–2.7 mm thick at midpoint. Seeds black, flattened, (3.2–) 3.7–5 (–5.3) mm long, (2.5–) 2.8–4 (–4.6) mm wide.

***Additional selected specimens examined*: Western Australia.** along No. 1 Rabbit Proof fence, 7 miles [11 km] N of Sandy Creek, May 1947, *Royce 1638* (PERTH); Dovers Hills, northern Gibson Desert, Jul 1967, *George 8977* (PERTH); 50 miles [80 km] W of Giles, Jun 1968, *Howard s.n.* (PERTH); Canning Stock Route, Jul 1976, *Palmer 27* (PERTH); Bloodwood Bore, Balweena Reserve, Aug 1969, *Nelson 1925* (PERTH); S side of Petermann Ranges, W of N.T. – W.A. border, Sep 1978, *Beauglehole 60602 & Errey* (PERTH); 14 km S of Kumarina, N of Meekatharra, May 1975, *Symon 10000* (PERTH); 18 km S of Two Sisters, *c.* 160 km SE of Shay Gap, Jul 1984, *Newbey 10403* (PERTH); Balgo Hills, via Derby, 15 June 1967, *McNamara 1c* (PERTH). **Northern Territory.** Burt Plain: 21 miles [34 km] SW of Napperby Station, Sep 1956, *Lazarides 6001* (CANB, NT, PERTH); Stirling Bore, 5 miles [8 km] S of Barrow Creek township, Sep 1955, *Perry 5349* (K, L, MEL, NSW, NT, US). Davenport Murchison Range: Elkedra Station, May 1977, *Latz 6962* (ADW, BRI, NSW, NT); 98 km E of Three Ways on Barkly Highway, Jun 2004, *McKenzie RAM04/63* (BRI). Great Sandy Desert: Wartupunya Rockhole, Jan 1972, *Latz 2137* (ADW, NT); Pulca Currinya, Mt Wedge Station, Sep 1976, *Latz 6601* (ADW, CANB, NT). Macdonnell Ranges: Mt Liebig area, Apr 1972, *Latz 2272* (ADW, NT); Haasts Bluff airstrip, Nov 1976, *Latz 6667* (ADW, CANB, NT). Ord Victoria Plain: road to Lajamanu from Buntine Highway, May 2004, *Brennan 6299* (AD, DNA, NT, PERTH). Tanami: Stuart Highway near Ali Curung turnoff, Jun 2006, *Albrecht 12049* (BRI, NT); The Granites Tenements, Dec 1984, *Kalotas 1797* (ADW, NT, PERTH).

***Distribution and habitat*:** *Solanum chippendalei* is found in arid and semi-arid parts of north central to southwest NT (from Wave Hill Station in the northwest to Georgina Downs in the northeast, and to Docker River in the far southwest), extending westward into WA as far west as the Pilbara (**Map 1**). A specimen from Alice Springs (*Latz 22296*) is certainly a recent introduction from seed discarded by aborigines. It occurs in *Triodia* dominated communities on sandy or gravelly plains and hillslopes. Germination and clonal regrowth is strongly encouraged by fire or soil disturbance and it is commonly found on roadsides.

***Phenology*:** Flowers and fruits can be found at any time of the year depending on timing of rains and/or fire.

***Notes*:** *Solanum chippendalei* is closely allied to *S. succosum* (see notes under that species). It is also very close to *S. phlomoides* A.Cunn. ex Benth. Both *S. chippendalei* and *S. phlomoides*, as currently understood, are quite variable, and distinguishing between them is difficult.

***Ethnobotany*:** The fruit of *Solanum chippendalei* is an outstandingly important plant food for central Australian aborigines throughout its distribution range, and it has various language names. The seeds are removed and the thick pericarp eaten, which has a rather bland taste reminiscent of cantaloupe (rockmelon). Although relatively high in vitamin C, it has quite low protein and fat values (Latz 1995). The ripe fruit has excellent keeping qualities. Those not eaten fresh are sometimes threaded onto skewers or made into pasteballs, dried and stored for considerable periods. In recent times

Alyawarr people (NT) have deliberately established colonies of *S. chippendalei* south of its natural range by scattering seeds near their camp sites (Latz 1995). This practice has also been reported by Walsh (in prep.) for the Martu people of the western Great Sandy Desert area in the vicinity of Rudall River and the central Canning Stock Route. Martu elders assert that they have always scattered the seeds of *S. chippendalei* and believe that it is their role to disperse productive plants (Walsh, in prep.).

Several language groups, *e.g.* Warlpiri, Pitjantjatjara, Martu and probably Pintubi recognise two forms of *Solanum chippendalei* (Latz 1995; Walsh, in prep.). The form found on hillsides is called *ngayaki* (Warlpiri), *pura* (Pitjantjatjara) and *piljiwin* (Martu), and the sandplain form is called wanakiji (Warlpiri) and *pura* (Martu) (Latz 1995; Walsh, in prep.). In our investigations we have not found any reliable morphological characters that differentiate the habitat forms recognised by some aboriginal groups.

***Etymology*:** Named for George Chippendale (1921–extant), a botanist who worked for many years in the arid parts of Northern Territory, based at Alice Springs.

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We thank the Directors of CANB and PERTH for the loan of specimens, the Directors of MEL and DNA for access to those Herbaria, Peter Latz for alerting us to the distinctiveness of *Solanum succosum*, Tim Collins for growing plants for study, Myf Turpin, Glenn Wightman and Fiona Walsh for ethnobotanical information, Will Smith (BRI) for the illustrations, and Peter Bostock for the Latin diagnosis and for producing the distribution maps.

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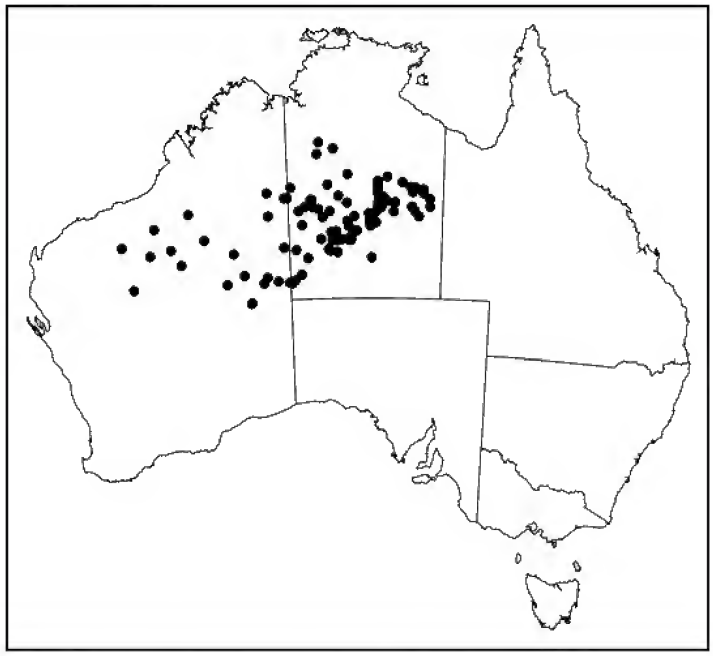
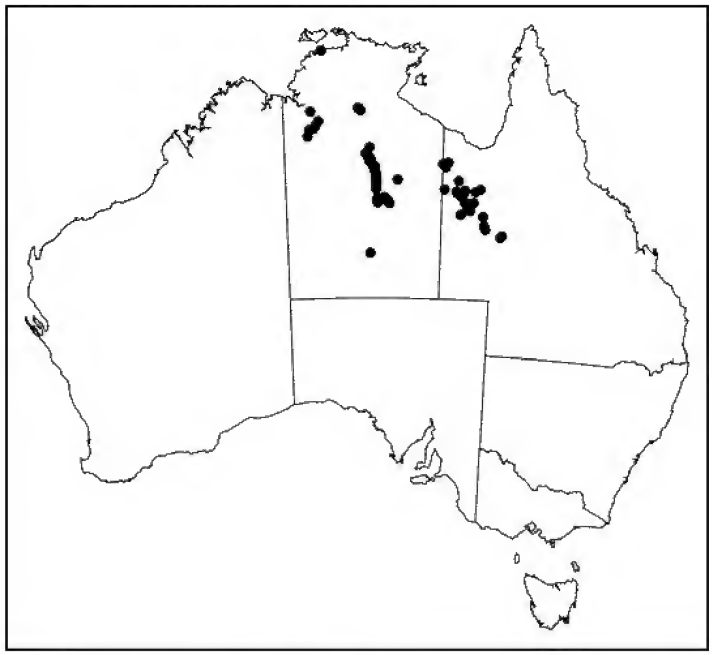


Map 1. Distribution of *Solanum chippendalei*.



Map 2. Distribution of *Solanum succosum*.

F.M.Bailey's taxonomy of A.Meston's collections from the Bellenden Ker Expedition of 1904

John Leslie Dowe[1] & Alan D. Broughton[2]

Summary

Dowe, J.L. & Broughton, A.D. (2008). F.M.Bailey's taxonomy of A.Meston's collections from the Bellenden Ker Expedition of 1904. *Austrobaileya* 7(4): 677–679. The four new taxa described by F.M.Bailey for collections made by A.Meston during his 1904 ascent of Bellenden Ker Range, were first published in a Parliamentary Paper tabled 1st June 1904. This preceded his publication in the *Queensland Agricultural Journal,* on 1st July 1904. A note is also provided on place names associated with Bellenden Ker Range and their recommended spelling.

Key Words: F.M.Bailey, A.Meston, Bellenden Ker Range, Queensland botany

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Introduction

F.M.Bailey's contribution to the botany of Bellenden Ker Range is mostly contained in two reports, and based on collections made during expeditions in 1889 and 1904. Both expeditions were organized and led by Archibald Meston (Meston 1889, 1904). Bailey's only ascent of the range was during the 1889 expedition, during which some 600 specimens were collected. An account of the 1889 expedition itinerary and route, and a re-assessment of the taxonomic and nomenclatural results were provided by Dowe & Broughton (2007). The expedition of 1904 was conducted under the auspices of the Queensland Government Lands Department, and was not so much a scientific expedition but one which "confined itself almost entirely to the economic plants … or promise to be of practical value to mankind" and to have "obtained as many specimens as possible for Mr Bailey's herbarium" (Meston 1904, p. 3 [p. 1009]; **Table 1**). In the introductory section of the report, Meston wrote short accounts on Timbers, Gums, Wood for Veneer, and on the Aborigines and their names for various plant species.

Table. 1. Meston's itinerary for the 1904 ascent of Bellenden Ker Range

Activity	Date
Departed Brisbane for Cairns	12 January
Arrived Cairns	17 January
Departed Cairns for Bellenden Ker Range	19 January
Summit camp	24–29 January
Returned to Cairns	8 March
Departed Cairns for Brisbane	9 March
Arrived Brisbane	14 March

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In the botanical section of the report, Bailey listed 200 taxa that were collected by Meston or his indigenous collectors (see figure in Clarke 2008: 145). The specimens were seen and examined by Bailey upon their arrival in Brisbane. A search of herbaria [BRI, BM, K, MEL, NSW] revealed 109 specimens are extant and otherwise attributed to Meston from the 1904 expedition. It must be assumed that some of Meston's collections may not have been conserved as herbarium specimens, or otherwise have not survived, hence the disparity between the number of species listed by Bailey in the report and the number of specimens that have been located.

F.M.Bailey's botanical report of the 1904 expedition

Four new species were described by Bailey from Meston's collections from the Bellenden Ker Range expedition of 1904 (**Table 2**). Citations from the taxonomic literature give the place of publication of the new species as the *Queensland Agricultural Journal* of July 1904 (Bailey 1904b). However, there is a prior publication which should be cited as the place of valid publication of the four species, a Parliamentary Paper that was tabled 1 June 1904 (Bailey 1904a) (pers. comm., D. Embury, Queensland Parliamentary Service). Tabling of a Parliamentary Paper qualifies as 'effective and valid publication' under the International Code of Botanical Nomenclature (McNeill *et al.*, 2006). The protologues were identical apart from some very minor grammatical and punctuation changes in each publication, and each new taxon was appended as being a '*sp. nov.*' in both publications.

Table 2. New taxa described by F.M.Bailey from Meston's 1904 Bellenden Ker Range expedition collections

Taxon/Species	Bailey, 1904a	Bailey, 1904b	Type citation	Location of types
Pentapanax bellendenkerensis F.M.Bailey [= *Polyscias bellendenkerensis* (F.M.Bailey) Philipson] [Araliaceae]	p. 12	p. 491	Summit of Bellenden-Ker, Meston's expedition, 1904, A.Meston 68	holo: BRI
Psychotria coelospermum F.M.Bailey [Rubiaceae]	p. 13	p. 492	Barron R, 1877, Bailey; Meston's Expedition to Bellenden-Ker, 1904	Bailey syntype specimen at BRI; Meston syntype specimen not located*
Lucuma obpyriformis F.M.Bailey [= *Pouteria obpyriformis* (F.M.Bailey) Baehni = *Sersalisia sericea* (Aiton) R.Br.] [Sapotaceae]	p. 13	p. 493	Meston's Bellenden-Ker Expedition, 1904 [Mt Toressa, 1904, Meston 29]	holo: BRI
Bulbophyllum lageniforme F.M.Bailey [Orchidaceae]	p. 16	p. 494	Bellenden-Ker Expedition, 1904, A.Meston s.n.	**lecto: BRI; isolecto: K

*P.I.Forster, pers. comm. April 2008.

**selected by Clements (1989).

Places names associated with Bellenden Ker Range

According to the Queensland Place Names Gazetteer, the official spelling of the name Bellenden Ker does not use a hyphen. In Dowe & Broughton (2007) we followed Meston's (1889) account of his report to Parliament, '*Report by A. Meston on the Government Scientific Expedition to the Bellenden-Ker Range (Wooroonooran) North Queensland*' where he used the hyphenated spelling and continued to use this form in all his subsequent publications. The use of a hyphen appears to have ceased in the 1920s, and it has more or less been consistently unhyphenated since then, although Clarke (2008) has recently maintained the older usage.

The highest peak on the northern section of the Bellenden Ker Range is listed in the Gazetteer as 'Centre Peak', rather than 'Mt Bellenden Ker' or 'Mt Bellenden Ker Centre Peak' (*cf.* Dowe & Broughton 2007).

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New subspecies for *Zieria odorifera* J.A.Armstr. (Rutaceae) from northern New South Wales

Marco F. Duretto[1] & Paul I. Forster[2]

Summary

Duretto, M.F. & Forster, P.I. (2008). New subspecies for *Zieria odorifera* J.A.Armstr. (Rutaceae) from northern New South Wales. *Austrobaileya* 7(4): 681–690. Three new subspecies of *Zieria odorifera* endemic to northern New South Wales are described and illustrated, these being: subsp. *copelandii* Duretto & P.I.Forst., subsp. *warrabahensis* Duretto & P.I.Forst. and subsp. *williamsii* Duretto & P.I.Forst. A key to the four subspecies of *Z. odorifera* is provided.

Key Words: Rutaceae, *Zieria*, *Zieria odorifera*, *Zieria odorifera* subsp. *copelandii*, *Zieria odorifera* subsp. *odorifera*, *Zieria odorifera* subsp. *warrabahensis*, *Zieria odorifera* subsp. *williamsii*

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Introduction

Zieria Sm. (Rutaceae) contains *c.* 60 species restricted to eastern Australia (Queensland, New South Wales, Victoria, South Australia and Tasmania) and one species, *Z. chevalieri* Virot, which is endemic to New Caledonia (see Armstrong 2002; Duretto & Forster 2007).

Two species were identified in the *Flora of New South Wales* under the phrase names *Ziera* sp. 'Cathedral Rock' (Williams 95303) and *Z.* sp. 'Oxley Wild Rivers N.P.' (Copeland 2174) (Armstrong & Harden 2002). In anticipation of the forthcoming account of the genus for the *Flora of Australia* these informal taxonomic concepts were evaluated. Both concepts were found to be conspecific with *Z. odorifera* J.A.Armstr. and represent variants of a new subspecies which is described below, along with two other new subspecies. These four subspecies form a geographic replacement series throughout the overall species range and can be viewed as representing distinct regional elements in the process of speciation via isolation and local genetic drift. The subspecies are distinct in character combinations predominantly composed of indumentum type and cover and the size of some foliar and floral characters.

Materials and methods

This paper is based on herbarium collections housed in BRI, CANB, MEL, NE and NSW. Our descriptions follow the format used by Duretto & Forster (2007).

Taxonomy

The key to the species of *Zieria* found in New South Wales (Armstrong & Harden 2002) requires amendment to accommodate all taxa found in this state. For example, with *Z. odorifera* the key (p. 278: Group 3, couplet 4), and later the description of the species, indicate that the fruit is pubescent or hirsute, though many of the specimens Armstrong (2002) cites in the protologue have glabrous fruit. In addition, some specimens have stellate hairs dominating the indumentum of the stems and so belong to Group 4 of Armstrong & Harden (2002) and thus will not key out to *Z. odorifera*. To key out *Z. odorifera* in the *Flora of New South Wales* the following couplets need to be inserted.

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Zieria *Group 3 (Armstrong & Harden (2002, p. 278)*

3* Petals white or rarely white with pink tips; inflorescence mostly 1–3-flowered, shorter than or longer than leaves . . . . . .

4 Abaxial surface of sepals glabrous . . . . . **11. Z. adenophora**
4* Abaxial surface of sepals variously hairy . . . . . .

5 Leaflets cuneate-obovate to obcordate, margins flat to slightly recurved; petals 2–2.5 mm long . . . . . **12. Z. obcordata**
5* Leaflets leaflets narrow elliptic to narrow oblanceolate to oblanceolate, margins slightly recurved to revolute; petals 2–4.5 mm long . . . . . **8. Z. odorifera**

Zieria *Group 4 (Armstrong & Harden (2002, p. 279)*

2* Lower surface of leaflets glabrous or hirsute, but never velvety . . . . . .

10a Leaflets usually < 3.5 mm wide; petioles < 6 mm long . . . . . .

10b Petioles 1–1.5 mm long; leaflets 2.5–5 mm long . . . . . **8. Z. odorifera**
10b* Petioles 4–6 mm long; leaflets 17–25 mm long . . . . . **23. Z. floydii**

10a* Leaflets mostly 4–7 mm wide; petioles 8–20 mm long . . . . . **24. Z. smithii**

Zieria odorifera J.A.Armstr., *Austral. Syst. Bot.* 15: 412 (2002). **Type:** New South Wales. North Western Slopes: Warrumbungle Range, Burrumbuckle Rock, 8 November 1977, *M.D.Crisp 3609* (holo: CANB [CBG7707801]; iso: NSW 455488).

Erect to prostrate, sometimes spindly, shrub, to 1 m tall. Branches not or weakly to strongly glandular verrucose, sparsely to densely pilose with mainly simple and bifid hairs, or stellate hairy, hair distribution even, rarely concentrated between decurrent leaf bases which are poorly developed or absent. Leaves palmately trifoliolate, strongly odoriferous, glabrescent to pilose; petioles 1–2 mm long, not or weakly to strongly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate to oblanceolate, 2.5–10 × 1–5 mm, tips obtuse to acute, margins slightly recurved to revolute, smooth to glandular dentate, midrib raised abaxially and not to strongly glandular verrucose, adaxial surface not or strongly glandular verrucose; lateral leaflets similar to terminal leaflets though usually smaller. Inflorescence axillary, shorter to longer than the subtending leaves, 1–3(–12)-flowered; peduncle 1–7 mm long, not or weakly glandular verrucose, pilose with simple, bifid and trifid hairs or sparsely stellate hairy, often hairs concentrated between decurrent bract bases; bracts narrow-elliptic to narrow-lanceolate, persistent, 1–4 mm long, leaflet-like; pedicels 1–5 mm long, with a sparse to moderately dense indumentum of stellate and/or bifid and/or simple hairs. Sepals ovate-deltate to deltate, 1–2 × 0.7–1.5 mm, slightly imbricate in bud, not or weakly glandular verrucose, tips acute or rarely slightly acuminate, adaxial surface glabrous or sparsely pilose, abaxial surface glabrous or variously hairy. Petals elliptic, 2–4.5 × 1.2–2.5 mm, white to pale pink, slightly imbricate in bud, not obviously glandular or with a few obvious glands near tip, adaxial surface glabrous to sparsely pilose, abaxial surface with a dense indumentum of mainly minute stellate hairs or glabrous. Staminal filaments 0.75–1.2 mm long, glabrous, smooth; anthers 0.5–0.8 mm long, apiculum absent or minute. Gynoecium glabrous or hirsute. Cocci 3–3.5 mm × 1.75–2.5 mm, smooth to slightly glandular verrucose, glabrous or with a sparse to dense indumentum of simple, bifid and/or stellate hairs, base of style sometimes persistent forming a minute apical apiculum. Seeds 2–2.5 × 1–1.5 mm, black, striate, with white material between striations.

***Distribution and habitat*:** *Zieria odorifera* is endemic to New South Wales and occurs in rocky areas from Kaputar N.P. and the Inverell area east to Cathedral Range N.P. and south to Warrumbungle N.P. with isolated occurrences further south near Mendooran and Molong. The species is usually found in rocky situations in heathland, shrubland and woodland.

Key to subspecies

1 Petals glabrous or glabrescent on abaxial surface . . . . . subsp. **copelandii**
1. Petals densely hirsute on abaxial surface 2

2 Branches with an indumentum of mainly stellate hairs; sepals *c.* 1 mm long, glabrous or with a sparse indumentum of stellate hairs on the abaxial surface . . . . . subsp. **warrabahensis**
2. Branches pilose, with no or few stellate hairs; sepals 1–2 mm long, variously pilose on the abaxial surface though a few stellate hairs may also be present 3

3 Petals 4–4.5 mm long [though smaller petals *c.* 3.5 mm long may rarely be also present]; leaflets usually oblanceolate with smooth or slightly glandular dentate margins . . . . . subsp. **odorifera**
3. Petals 2–2.5(–3.5) mm long; leaflets usually narrowly elliptic or narrowly oblanceolate with margins slightly to prominently glandular dentate . . subsp. **williamsii**

Zieria odorifera J.A.Armstr. subsp. **odorifera**

***Illustrations*:** Armstrong (2002: 412, 413); Armstrong & Harden (2002: 282) [as *Z. odorifera*].

Erect or spreading shrub, to 1 m tall. Branches moderately densely to densely pilose, with mainly simple and bifid hairs. Leaves pilose; petioles 1–2 mm long, not or weakly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate to oblanceolate, 3.5–10 × 2–5 mm, margins smooth to slightly glandular dentate, adaxial surface not or slightly glandular verrucose. Inflorescence usually longer than the subtending leaves, 1–3(–7)-flowered; peduncle 1.5–7 mm long, pilose with simple, bifid and trifid hairs; pedicels 1–5 mm long, with a moderately dense indumentum of mainly stellate and bifid hairs. Sepals 1.5–2 × 1.2–1.5 mm, abaxial surfaces minutely pilose, sometimes with bifid and stellate hairs as well. Petals (3.5–) 4–4.5 × (1.7–) 2–2.5 mm, adaxial surface sparsely pilose, abaxial surface with a dense indumentum of mainly minute stellate hairs. Ovary hirsute; style hirsute at base. Cocci smooth, with a sparse to dense indumentum of simple, bifid and/or stellate hairs or rarely (Mt Bulga) glabrous.

***Additional specimens examined*:** **New South Wales**. North Western Slopes: Summit of Mt Bulga, May 2003, *Lewer & Chaffey s.n.* (NSW); Walking track to Belougery Split Rock, Warrumbungle N.P., Oct 1993, *Johnstone 414 & Burrell* (MEL); Warrumbungle N.P., Oct 1964, *Vickery & Fraser s.n.* (NSW); Split Rock, 24 km NW of Coonabarabran, Dec 1973, *Streimann s.n.* (CANB, NSW); Burbie Spring to Ailinn Plateau, Warrumbungle N.P., Oct 1974, *Harden s.n.* (NE); Belougery Split Rock, Warrumbungle N.P., Oct 1974, *Harden s.n.* (NE); Warrumbungles Range, Sep 1966, *Frazer s.n.* (NE); Warrumbungle Mts, May 1946, *Althofer 89* (NSW); 2.3 km E of Burrumbuckle Rock, Warrumbungle N.P., Oct 1978, *Crisp 4345* (CANB); Mt Wombelong, Warrumbungle N.P., Dec 1973, *Streimann s.n.* (CANB). Central-West Slopes: near Mendooran, Sep 1945, *Althofer & Dripstone 40* (MEL); *c.* 9 km (direct) of Molong, Bocoble Gap, Oct 1992, *Makinson 1196* (BRI, CANB, MEL, NE, NSW).

***Distribution and habitat*:** *Zieria odorifera* subsp. *odorifera* appears to be widespread in Warrumbungle N.P. In addition, three isolated collections have been made outside the park area to the north at Mount Bulga, and south near Mendooran and Molong. The subspecies is found in heath, shrubland and low eucalypt woodland on sandstones and trachyte, often in rocky situations.

***Phenology*:** Flowers have been collected from September to December, and fruit from October to December.

***Notes*:** The material from Mount Bulga differs from the remaining material of this subspecies in having glabrous fruit and leaves that are slightly more glandular verrucose. Hair density on the fruits is quite variable in material from elsewhere with the type having sparse indumentum on the fruit, while some other specimens have a dense indumentum. The fruit of *Zieria odorifera* subsp. *williamsii* may also be glabrous to densely hirsute so the taxonomic value of this character is questionable with such a small sample size. Only one plant was recorded on Mt Bulga at the time of the collection and so further field research is required to determine if the variation noted warrants taxonomic recognition.

***Conservation status*:** Few collections have notes on population size though a few collectors (e.g. *Crisp 3609*, *Johnstone 414 & Burrell*, *Makinson 1196*) noted that the taxon was rare. *Zieria odorifera* subsp. *odorifera* has been mainly found in Warrumbungle N.P. though its abundance there is unknown at this stage. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy, prior to making a conservation assessment; however, a provisional assessment would be Least Concern (IUCN 2001).

Zieria odorifera subsp. **copelandii** Duretto & P.I.Forst., **subspecies nova** a subspecie typica petalis sepalisque glabris differt. **Typus:** New South Wales. North Western Slopes: Mount Kaputar National Park, 5 October 2002, *L.M.Copeland 3432* (holo: NE 80023A; iso: BRI, CANB; NSW *n.v.*).

Erect shrub to 20 cm tall. Branches with a sparse indumentum of simple, bifid and stellate hairs. Leaves with a few simple hairs on midvein and/or margin; petioles 1–1.5 mm long, weakly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate to oblanceolate, 5–8.5 × 1.5–3.5 mm, margins entire to slightly glandular dentate, adaxial surface not glandular verrucose. Inflorescence usually *c.* equal to subtending leaves, 1–3(–7)-flowered; peduncle 3–7 mm long, pilose with simple, bifid and trifid hairs concentrated between decurrent bract bases; pedicels 1.5–3.5 mm long, with a sparse to moderately dense stellate indumentum. Sepals 1–1.5 × 1–1.3 mm, abaxial surfaces glabrous or with few stellate hairs towards base. Petals *c.* 3.5 × 1.7 mm, adaxial surface glabrous or glabrescent, abaxial surface glabrous or with a few hairs near margins. Gynoecium glabrous. Cocci smooth, glabrous. **Fig. 1.**

***Additional specimens examined*:** **New South Wales.** North Western Slopes: 33 km from Narrabri to Mt Kaputar, Aug 1973, *Muffet M3/95* (CANB); Mt Kaputar N.P., *c.* 1.5 km from park entrance on road to Mt Kaputar, Oct 1989, *Jones 5182A* (CANB).

***Distribution and habitat*:** *Zieria odorifera* subsp. *copelandii* is known only from Mount Kaputar N.P. It has been collected from rocky outcrops in heath with *Prostanthera cruciflora*, *Calytrix tetragona* and *Kunzea* sp.

***Phenology*:** Flowers and fruits have been collected in October.

***Conservation status*:** *Zieria odorifera* subsp. *copelandii* appears to be restricted to Mount Kaputar N.P. with collectors (*Copeland 3432*, *Jones 5182A*) noting that it was rare. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy prior to ascertaining its conservation status. The restricted distribution would indicate that a status of at least Vulnerable based on the criterion D2 is warranted (IUCN 2001).

***Etymology*:** The name honours Dr Lachlan Copeland, a botanist based in north-eastern New South Wales, whose collections have added much to the knowledge of the flora of New South Wales.

Zieria odorifera subsp. **warrabahensis** Duretto & P.I.Forst., **subspecies nova** a subspecie typica indumento in caulibus sepalisque ex pilis praecipue stellatis constato (in illis ex pilis praecipue simplicibus vel bifidis constato) differt. **Typus:** New South Wales. North Western Slopes: Warrabah National Park, 22 October 2006, *L.M.Copeland 4113 & D.M.Raets* (holo: NE 88972; iso: BRI, CANB, HO, NSW).

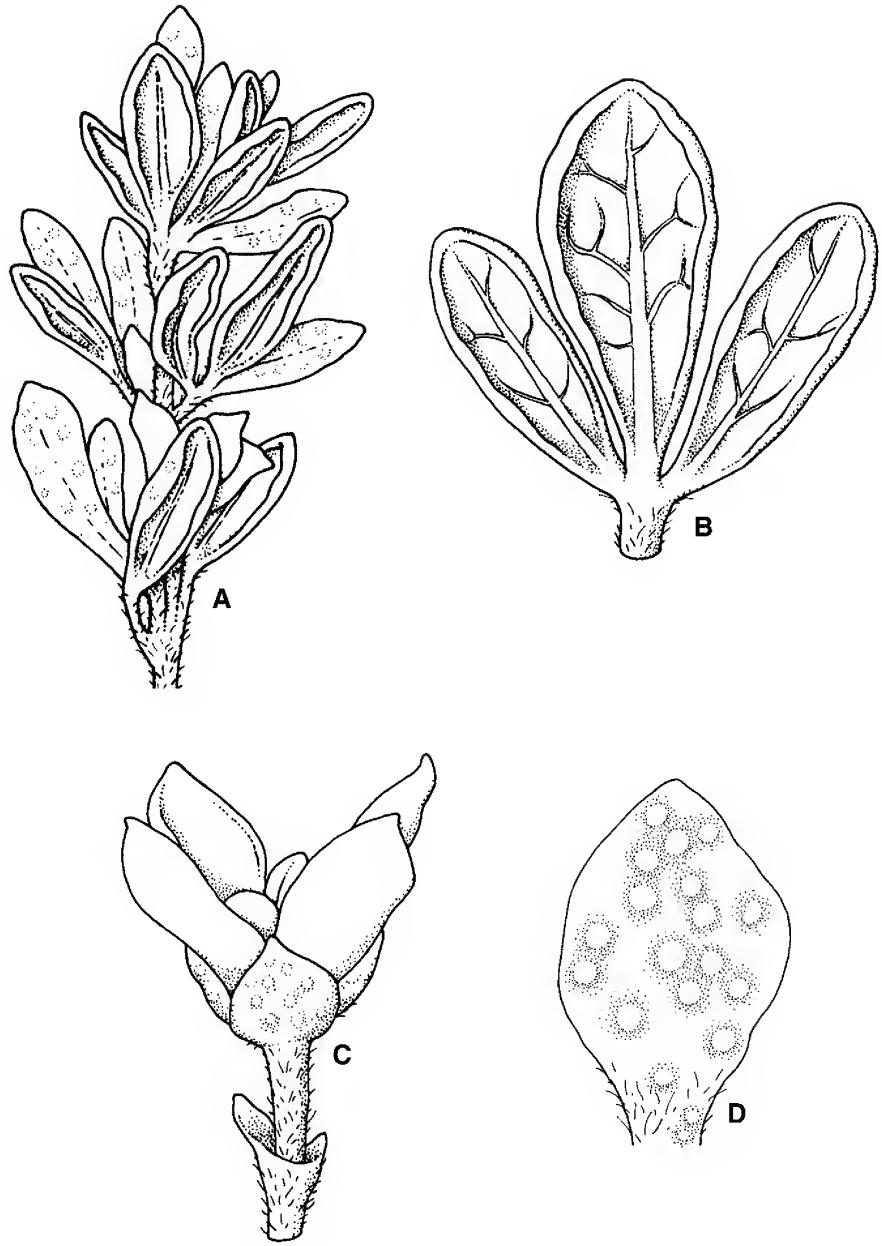

Fig. 1. ***Zieria odorifera*** **subsp.** ***copelandii.*** A. branch with single flowering inflorescence × 5. B. abaxial view of leaf × 8. C. inflorescence with flower × 12. D. adaxial view of petal × 30. All from *Copeland 3432* (BRI). Del. B. Connell.

Erect shrub to 40 cm tall. Branches with a moderately dense indumentum of mainly stellate and some bifid hairs. Leaves sparsely pilose sometimes with hairs concentrated on midribs; petioles 1–1.5 mm long, glandular verrucose; terminal leaflets narrowly elliptic to oblanceolate, 2.5–5 × 1–3 mm, margins slightly to obviously glandular dentate, adaxial surface not glandular verrucose. Inflorescence usually longer than the subtending leaves, 1–3-flowered; peduncle 3–5 mm long, sparsely stellate hairy; pedicels 1–1.5 mm long, with

a sparse stellate indumentum. Sepals *c.* 1 × 1 mm, abaxial surfaces glabrous or with a sparse indumentum of minute stellate hairs. Petals *c.* 2.5 × 1.2 mm, adaxial surface sparsely pilose, abaxial surface with a dense stellate indumentum. Gynoecium glabrous. Cocci and seed not seen. **Fig. 2.**

***Additional specimen examined*: New South Wales.** North Western Slopes: Warrabah, W of Kingstown, Sep 1995, *Hunter 3590* (CANB, NE, NSW).

***Distribution and habitat*:** *Zieria odorifera* subsp. *warrabahensis* is restricted to Warrabah N.P. where it is found growing in skeletal sandy soils over granite in herbland, heath, and woodland of *Eucalyptus prava* and *Callitris endlicheri*.

***Phenology*:** Flowers have been collected in September and October.

***Conservation status*:** Collectors have noted (*Copeland 4113*) that *Zieria odorifera* subsp. *warrabahensis* is occasional and localised in its distribution. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy before providing an accurate conservation assessment. The highly restricted distribution would suggest that a status of Endangered may be warranted based on the criterion C2ii (IUCN 2001).

***Etymology*:** This subspecies is named after the range it is apparently restricted to.

Zieria odorifera subsp. **williamsii** Duretto & P.I.Forst., **subspecies nova** a subspecie typica petalis brevioribus plerumque 2–2.5 mm longis (in illis plerumque 4–4.5 mm longis) differt. **Typus:** New South Wales. Northern Tablelands: Oxley Wild Rivers National Park, 12 October 2002, *L.M.Copeland 3437 & D.A.Carter* (holo: NE 80033A; iso: BRI, CANB, MEL, K *n.v.*, NSW).

Zieria sp. 'Cathedral Rock' (J.B.Williams 95303); Armstrong & Harden (2002: 282)

Zieria sp. 'Oxley Wild Rivers N.P.' (Copeland 2174); Armstrong & Harden (2002: 283)

***Illustrations*:** Armstrong & Harden (2002: 282, as *Zieria* sp. 'Cathedral Rock' (J.B.Williams 95303); 283, as *Zieria* sp. 'Oxley Wild Rivers N.P.' (Copeland 2174)).

Erect or rarely prostrate or spreading shrub to 0.5 m tall. Branches with a moderately dense to dense indumentum of mainly simple and bifid (occasionally trifid and stellate) hairs. Leaves sparsely to moderately densely pilose, sometimes hairs only on midribs; petioles 1–2 mm long, weakly glandular verrucose; terminal leaflets narrow elliptic to narrow oblanceolate, (3–) 5–10 × 0.7–2 mm, slightly or prominently glandular dentate, adaxial surface slightly to strongly glandular verrucose. Inflorescence shorter to slightly longer or rarely much longer (Copeton Dam area) than the subtending leaves, 1–3 (–12)-flowered; peduncle 1–4 (–6) mm long, with a moderately dense indumentum of mainly simple and bifid hairs; pedicels 1–3 mm long, with a moderately dense indumentum of simple, bifid hairs or stellate hairs. Sepals 1–1.5 × 0.7–1.3 mm, abaxial surfaces with a moderately dense simple and bifid indumentum sometimes with few stellate hairs. Petals 2–2.5 (–3.5, Copeton Dam area) × 1.2–1.5 mm long, adaxial surface sparsely pilose, abaxial surface with a moderately dense to dense indumentum of mainly stellate hairs. Gynoecium glabrous to hairy on outer margin. Cocci slightly glandular verrucose, glabrous to densely pilose. **Fig. 3, 4.**

***Additional specimens examined*: New South Wales.** Northern Tablelands: Sydenham near Barraba, Oct 1914, *Rupp s.n.* (NSW); Inverell, Aug 1910, *Boorman s.n.* (NSW); Goonoowigall Bushland Reserve, near The Peaks, *c.* 6 km S of Inverell, Feb 1993, *Sipple 44 & Beckers* (NE); Murchison S.F., W side of Copeton Dam, Feb 2001, *Copeland 2836 & Westaway* (CANB, NE, NSW); 0.5 km N of Howell, Sep 1985, *Southwell* H85-042 (CANB); 2.4 km from Howell on track to Copeton Lake recreation area, Sep 1985, *Southwell* H85-039 (CANB); Copes Creek, S of Gilgai, Nov 1989, *Williams s.n.* (NE, NSW); Howell district, 70 km N of road to Copeton Dam, 8.4 km by road W of Inverell – Bundarra road, Oct 2001, *Copeland 3222* (CANB, NE, NSW); Howell, Aug 1905, *Boorman s.n.* (HO, CANB, MEL, NE, NSW); 2 km E of Howell, Sep 1966, *Williams s.n.* (NE50498A); 3 km E of Howell, Sep 1966, *Williams s.n.* (NSW651474, NE50532A); *ibid*, Dec 1971, *Williams s.n.* (HO544742, NE28958); 3.2 km E of Howell, Nov 1973, *Armstrong 683* (NSW); *ibid*, Dec 1971, *Williams s.n.* (HO, NE); 1 km S of Howell, Oct 1989, *Griffith & Williams s.n.* (NE); 2 km S of Howell, 1967, *Williams s.n.* (BRI [AQ510733], NSW651470); Single N.P., Mar 2000, *Copeland 2487* (NE, NSW); The Basin Nature Reserve, *c.* 20 km E of Bundarra, 2.8 km S of 'Lutana', Nov 2001, *Copeland 3260 & Croft* (CANB, NE); Parlour Mountains, 'Hardacres' property, *c.* 38 km NW of

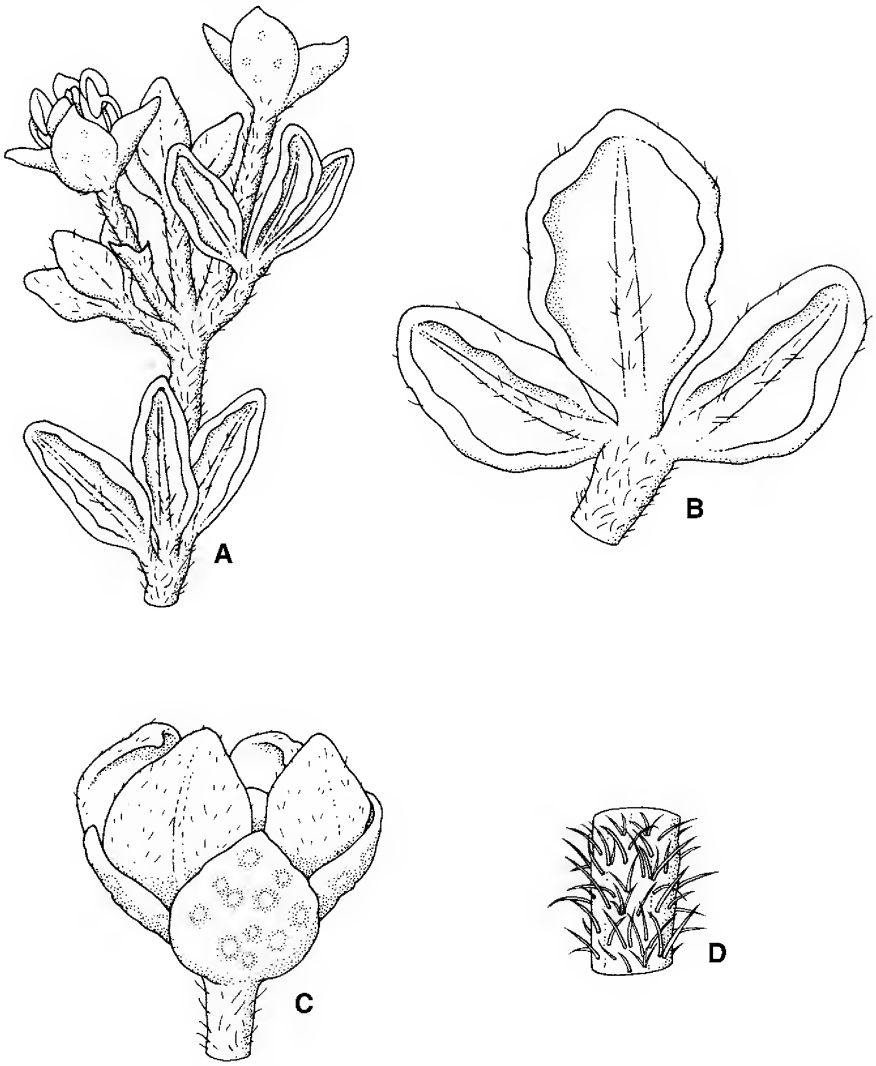

Fig. 2. *Zieria odorifera* subsp. *warrabahensis*. A. branch with several flowering inflorescences × 8. B. abaxial view of leaf × 10. C. lateral view of flower × 20. D. indumentum on leaf bearing branchlet × 20. All from *Copeland 4113* (BRI). Del. B. Connell.

Armidale, Aug 1991, *Hardaker s.n.* (NE); Snowy Range, Biffen's Block, 6.5 km WNW of Round Mt, Nov 1995, *Metcalf & Williams s.n.* (NE); The Pinnacle, 20 km W of Armidale, Jun 2007, *Telford 13165 & Bruhl* (HO, NE, NSW); The Pinnacle, 24 km W of Armidale, Oct 1975, *Wissman s.n.* (NSW); Biffen's property, Maiden Creek – adjoins western side of Cathedral Rock N.P., *c.* 15 km E of Wollomombi, Nov 1995, *Williams 95303 & Metcalf* (NSW); Oxley Wild Rivers N.P., Nov 1999, *Copeland 2174 et al.*, Nov 1999 (CANB, NE, NSW).

***Distribution and habitat*:** *Zieria odorifera* subsp. *williamsii* is known from scattered populations between Inverell, Cathedral Rock N.P. and Oxley Wild Rivers N.P. It is found on various rock types including granite, porphyry and other volcanics in heath, shrubland (dominated by, e.g. *Acacia neriifolia*) and woodland (dominated by, e.g. *Eucalyptus prava*, *E. laevopinea*, *E. dealbata* or *Callitris endlicheri*).

***Phenology*:** Flowers have been collected from August to November, and fruit from August to December (March, June).

Notes*: *Zieria sp. 'Cathedral Rock' (Williams 95303) and *Z.* sp. 'Oxley Wild Rivers N.P.' (*fide* Armstrong & Harden 2002) were separated from other species of *Zieria* on a few characters that included plant habit, inflorescence size relative to leaves, number of flowers per inflorescence and the pubescence of the cocci. These characters were found to be unreliable when a large number of collections were examined from the area between Howell and Cathedral Rock. Across the geographic range of *Z. odorifera* subsp. *williamsii* plants can have glabrous or hirsute fruit, and be erect, prostrate, ascending, etc.; thus these proposed diagnostic characters do not have much taxonomic relevance, they are simply variation. In addition, the collections from Howell that were included with *Z. odorifera* by Armstrong (2002) and Armstrong & Harden (2002) do not have petals *c.* 4.5 mm in length but *c.* 2.5 mm in length. *Zieria* sp. 'Cathedral Rock' (Williams 95303) and *Z.* sp. 'Oxley Wild Rivers N.P.' are based on a few specimens that are forms of the taxon recognised here which is variable in plant habit and in the amount of pubescence on the leaves and fruit (**Fig. 3 & 4**). The pubescence of the abaxial surface of the petals, and the composition of the indumentum is uniform and thus of taxonomic value for *Z. odorifera* (see key above).

Specimens from the Copeton Dam (e.g. *Copeland 3222*) and Inverell (e.g. *Sipple 44 & Beckers*) areas are almost intermediate between *Zieria odorifera* subsp. *odorifera* and the more 'typical' forms of *Z. odorifera* subsp. *williamsii* in that they have longer peduncles (to 6 mm long), inflorescences that are much longer than the leaves, larger petals (to 3.5 mm long) and leaves that are not always glandular dentate. These somewhat intermediate specimens are allocated with a little difficulty to the latter subspecies and

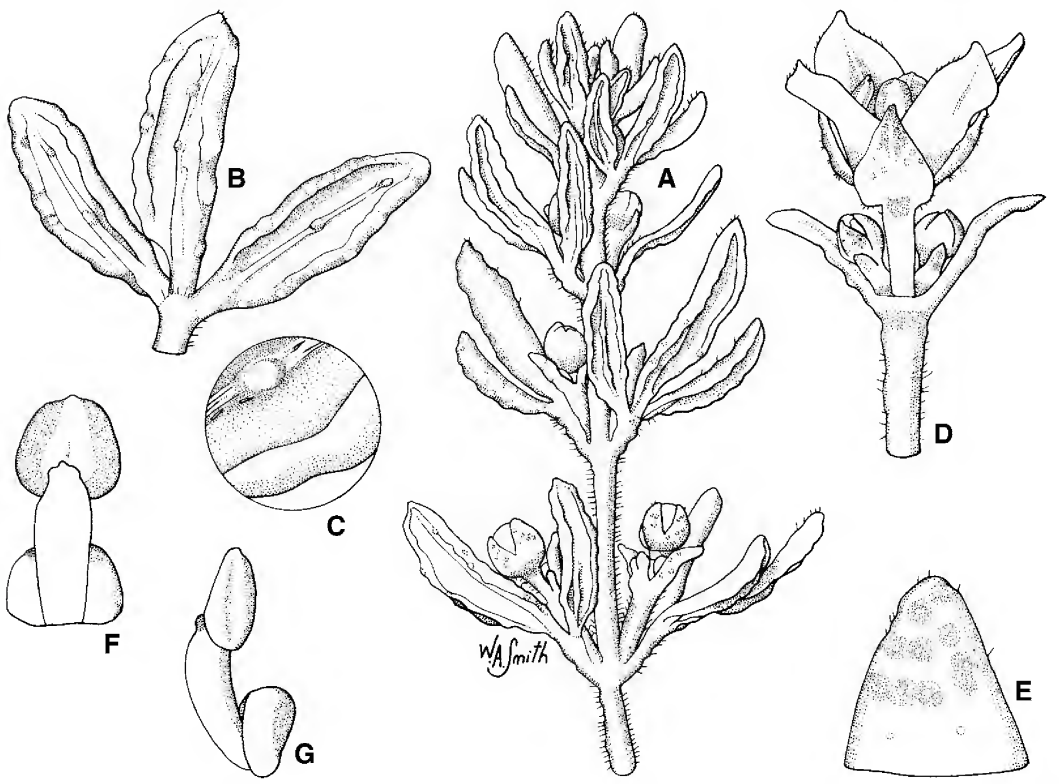

Fig. 3. *Zieria odorifera* subsp. *williamsii* (less hairy variant). A. branch with several flowering inflorescences × 4. B. abaxial view of leaf × 8. C. detail of abaxial leaf surface showing indumentum cover × 20. D. inflorescence with flower and buds × 8. E. tip of sepal × 20. F–G. views of stamens × 20. All from *Copeland 3437* (BRI). Del. W. Smith.

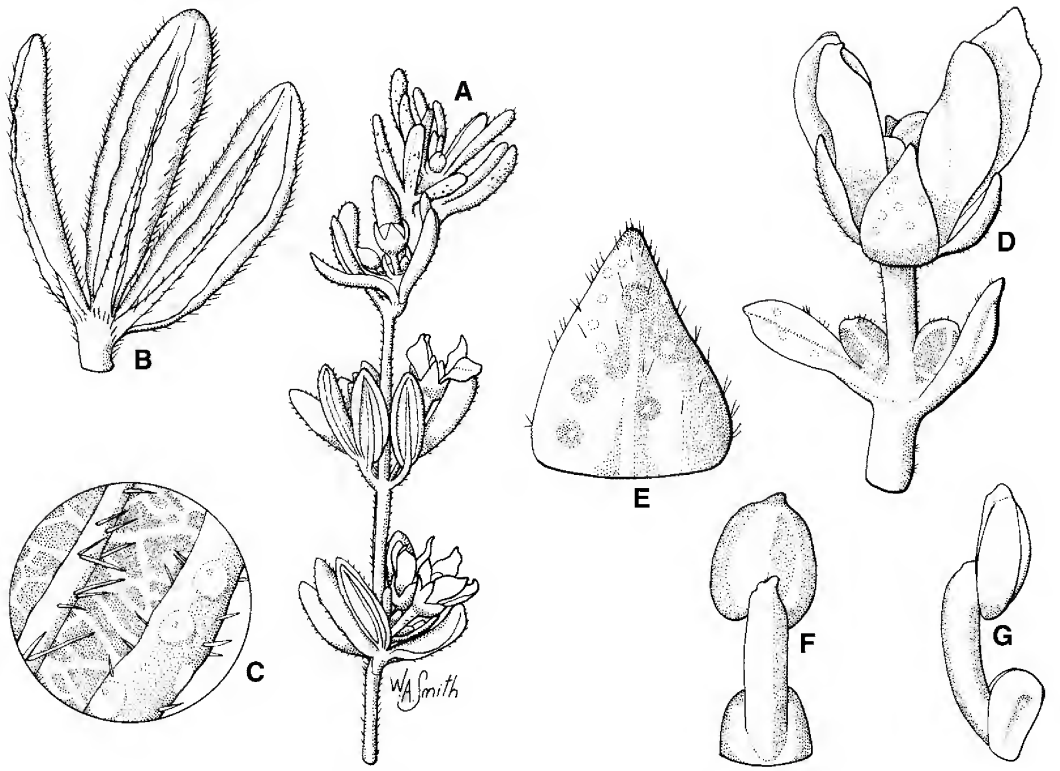

Fig. 4. *Zieria odorifera* subsp. *williamsii* (more hairy variant). A. branch with several flowering inflorescences × 2. B. abaxial view of leaf × 6. C. detail of abaxial leaf surface showing indumentum cover × 20. D. inflorescence with flower and buds × 8. E. tip of sepal × 20. F–G. views of stamens × 20. All from *Williams s.n.* (BRI [AQ510733]). Del. W. Smith.

are one of the reasons why these taxa are being recognised at that rank. Field research with detailed population studies are required to determine if the variation seen on these few specimens is a true reflection of what is occurring *in situ*. Nevertheless outside these areas the smaller petals (2–2.5 mm long) and the narrow leaflets with glandular dentate margins easily separate *Z. odorifera* subsp. *williamsii* from the typical variety.

A putative hybrid between *Zieria odorifera* subsp. *williamsii* and *Z. cytisoides* (*Copeland 3439 & Carter*) has been collected in the Oxley Wild Rivers N.P. The single plant was isolated and plants of both parent species were present nearby (collector's notes).

***Conservation status*:** In some areas collectors (e.g. *Copeland 3260*, *Williams 95303*) have indicated that this taxon is rare while elsewhere (e.g. *Armstrong 683*, *Telford 13165*) it was noted as being common though localised. It is known from Oxley Wild Rivers and Cathedral Rock N.P.'s. Surveys are required to ascertain the size and extent of the known populations and the area of occupancy prior to ascertaining an appropriate conservation status, though it can be provisionally assessed as Endangered on the basis of criterion B2a,b(i–v) (IUCN 2001).

***Etymology*:** This subspecies is named in honour of John B. Williams (1932–2005) who did much to advance Australian botany (see Bruhl *et al.* 2005).

Acknowledgements

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Three new species of *Rhodomyrtus* (DC.) Rchb. (Myrtaceae) from Papua New Guinea[5]

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Summary

Snow, N., McFadden, J., & Atwood, J.P. (2008). Three new species of *Rhodomyrtus* (DC.) Rchb. (Myrtaceae) from Papua New Guinea. *Austrobaileya* 7(4): 691–706. Three new species of *Rhodomyrtus* (DC.) Rchb. are described from Papua New Guinea: *Rhodomyrtus longisepala* N.Snow & J.McFadden, *Rhodomyrtus guymeriana* N.Snow & J.P.Atwood, and *Rhodomyrtus misimana* N.Snow. Detailed descriptions, information on distributions and habitats, and conservation recommendations are provided for each new species. A tabular summary of some key vegetative and reproductive features is presented for species of *Rhodomyrtus sensu lato*. A membranous testa for three species of *Rhodomyrtus* is discussed for the first time, as is the occurrence of densely-packed, hair-like fibres comprising much of the outer testa in some species. Large, dark-maroon coloured cells in the fruit of some species impart visible pits on the outer surface of the seed coats in the dried fruits. Gelatinous endosperm is reported for the first time in the genus *Rhodomyrtus*, being present in *Rhodomyrtus guymeriana*. Transitions between the typological distinctions of eucamptodromous and brochidodromous leaf venation types are discussed for *Rhodomyrtus surigaoensis*.

Key Words: *Rhodomyrtus longisepala*, *Rhodomyrtus guymeriana*, *Rhodomyrtus misimana*, *Rhodomyrtus surigaoensis*, Myrtaceae, conservation, Papua New Guinea, Indonesia, seed morphology, systematics, biogeography, Owen Stanley Terrane, Kutu Terrane, Finisterre Terrane

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[5]*Pacific Biological Survey* contribution no. 2008-032 from the Bishop Museum

Introduction

The genus *Rhodomyrtus* (DC.) Rchb. comprises 22 currently recognized species (**Table 1**), which includes several species described (Guymer 1991; Snow 2006; herein) since the revision by Scott (1978). The native range of *Rhodomyrtus* extends from India and Sri Lanka to the Philippines south through Malesia to northeastern Australia and New Caledonia and Fiji (Scott 1978; Snow 2000, 2006). One species, *Rhodomyrtus tomentosa* (authorities in **Table 1**), the type species of the genus, is a highly aggressive weed in some tropical and semi–tropical areas, such as Hawaii and Florida (Wagner *et al.* 1999). The purpose of this paper is to describe three new species from Papua New Guinea and evaluate their conservation status, discuss and provide a tabular summary of some key vegetative and reproductive characters of *Rhodomyrtus*.

Materials and methods

Characters from herbarium specimens were measured following a descriptive format similar to Snow (2007). Descriptive terminology generally follows the Systematics Association Committee (1962). Leaf venation follows Hickey (1973; see also Simpson (2006)), whereas herbarium acronyms follow Holmgren & Holmgren (1998). Flowering material was unavailable for *Rhodomyrtus guymeriana* and *R. misimana*, but descriptions are as complete as possible given limited material. Two of the new species are known only from their type gatherings, whereas *R. misimana* is known from two gatherings. Fruits and seeds were dissected from several specimens housed at BISH (and one from K, with permission) by rehydrating for several minutes in boiling water.

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Taxonomy

Rhodomyrtus guymeriana N.Snow et J.P.Atwood, **species nova** *R. eleganti* affinis sed fructu costato differt. **Typus:** New Guinea. CENTRAL PROVINCE: Mori River, *c.* 15 km northeast of Cape Rodney, 10°04′S, 148°32′E, 30 August 1969, *R.Pullen 8167* (holo: A; iso: BRI, CANB [2 sheets], K).

Trees to 6 m tall. Bark of main stem unknown. Branchlets laterally compressed, wingless; epidermis villous (hairs whitish to reddish), oil glands absent. Stipules ("enations" of some authors) of several dark, relatively long setose hair–like structures ("type A" stipules sensu Snow *et al.* 2003: 6–7). Petioles 6–18 mm, flat above, eglandular, villous to tomentose becoming glabrous. Leaves coriaceous, discolorous, surfaces matt, venation brochidodromous. Leaf blades 9–16 × 3.3–7.5 cm, obovate to elliptic; base cuneate; apex mostly acute and often mucronate (infrequently broadly obtuse); margin flat. Adaxial leaf surface glabrescent to glabrate; midvein relatively broad, flush or slightly raised proximally; secondary veins distinct (tertiary veins less so); oil glands not visible. Abaxial leaf surface sparsely to moderately villous, especially on midvein and secondary veins; secondary and tertiary veins raised; intramarginal veins at midpoint of leaf prominent, 1–2.5 mm from leaf margin; margin flat; oil glands common but prominent only with magnification. Inflorescence lateral, evidently a solitary monad (more material needed). Flowering material unknown. Fruit (submature) baccate, broadly fusiform, 35–42 × 20–27 mm, 9-ribbed (ribs up to 5 mm deep), shortly villous throughout, pinkish when fresh; calyx lobes erect. Locules (from fruit) evidently 2 (or if 3 then one crushed); placentation axile. Seeds at least 5 (only half of one dried fruit available for analysis), embedded in pulpy flesh that adheres tightly to the thickly membranous testa. Embryo tightly circinate, *c.* 7 mm long and 3.2 mm thick at widest point, rounded, densely but minutely glandular; endosperm gelatinous but scant. **Fig. 1, 2.**

***Distribution and habitat*:** Attempts herein to reconcile the coordinates indicated on the collection label with modern satellite imagery (Google Earth©, 2008) suggest that the collection site from the Mori River was approximately 160 km southeast of Port Moresby and *c.* 19 km northeast (not 15 km as per label) of Port Rodney (**Map 1**). This interpretation seems feasible since a road cutting through forest meets the Mori River at *c.* 10°04′24.85′′S, 148°30′55.45′′E, which corresponds closely to the stated elevation of the type gathering of *c.* 30 m. If this interpretation is correct, it suggests the species occurs on the Kutu Terrane (Pigram & Davies 1987). The same recent satellite imagery indicates moderate levels of deforestation in an arc from the vicinity of Saint Stephens Mission, approximately 8 km to the northeast of the presumed collection site, more or less continuously to the south-southeast, roughly 3 km from the presumed collection site. The amount of potential alluvial habitat nearby that appears to be mostly forested includes an area of approximately 12.5 linear km to the southeast towards the town of Domara. To the northwest of the apparent collection site much higher amounts of deforestation have occurred west of the Mori River.

***Phenology*:** Known only from immature fruit in late August; likely flowering at least 2–4 weeks earlier.

***Notes*:** *Rhodomyrtus guymeriana* most closely resembles *Rhodomyrtus elegans* The species are similar by virtue of their relatively long and narrow petioles, leaf shapes and texture, and mucronate apices on some (but not all) leaves. The species differ by the brochidodromous venation (Hickey 1973) and barely perceptible (if at all) oil glands on the adaxial leaf surface of *R. guymeriana*, versus the eucamptodromous venation and dense, small, but easily seen oil glands on the adaxial leaf surface of *R. elegans*. In addition, the short pubescence on the secondary and tertiary veins on the abaxial leaf surface is denser on *R. guymeriana* than *R. elegans*. It should be noted that some specimens included by Scott (1978) in *R. elegans* may represent another undescribed species.

Rhodomyrtus guymeriana and *R. elegans* differ most prominently in their fruiting

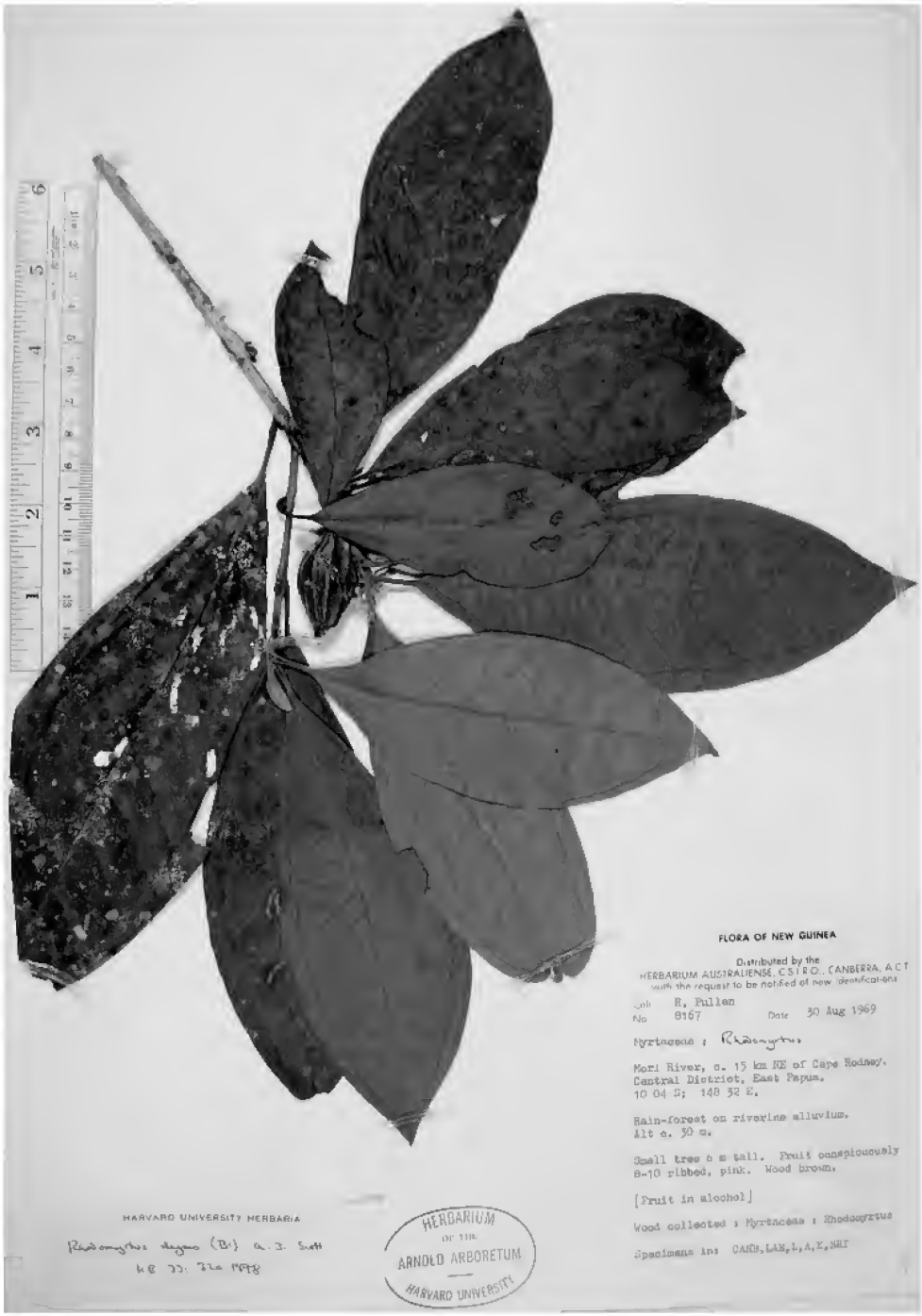
FLORA OF NEW GUINEA
Distributed by the
HERBARIUM AUSTRALIENSE, C.S.I.R.O., CANBERRA, A.C.T.
with the request to be notified of new identifications
Coll. R. Pullen
No. 8167 Date 30 Aug 1969
Myrtaceae : Rhodomyrtus
Mori River, c. 15 km NE of Cape Rodney,
Central District, East Papua.
10 04 S; 148 32 E.
Rain-forest on riverine alluvium.
Alt c. 30 m.
Small tree 6 m tall. Fruit conspicuously
8-10 ribbed, pink. Wood brown.
[Fruit in alcohol]
Wood collected : Myrtaceae : Rhodomyrtus
Specimens in: CANB, LAE, L, A, K, NHT
HARVARD UNIVERSITY HERBARIA
Rhodomyrtus elegans (Bl.) A. J. Scott
HERBARIUM
OF THE
ARNOLD ARBORETUM
HARVARD UNIVERSITY

Fig. 1. ***Rhodomyrtus guymeriana***. Holotype, *Pullen 8167* (A)

Table 1. Some key vegetative and reproductive characters of *Rhodomyrtus s.l.*

Venation patterns (Hickey 1973) can be brochidodromous (br), eucamptodromous (eu) or acrodromous (ac). The hypanthium in the flower can be smooth (sm), longitudinally ribbed (lr), or winged (wi). Placentation is axile (ax) or parietal (pa). Fruits are pulpy (pu) or not pulpy (np). Seed arrangement in the locules ("seeds") is irregular (ir) or stacked (st). Thin horizontal membranous partitions between seeds ("partitions") are present (+), absent (-), or consisting of large, dark maroon cells embedded into the testa (dmc). Outer testal layers are sclerotic (sc) or membranous (mb). Embryos are C-shaped (c) or circinate (ci). Data taken from specimens at BISH; character states not yet known or uncertain designated by "?". Excluding polymorphisms within a species and uncertainties, at least nine permutations of these variables occur among the species (see Discussion).

Species	venation	hypanthium	placentation	fruit	seeds	partitions	testa type	embryo shape
R. canescens C.T.White & Francis	ac	sm, lr	ax	np	st	+	sc	c
R. effusa Guymer	ac	sm	ax	np	st	-	sc	c
R. elegans (Blume) A.J.Scott	eu	sm	ax	pu	ir	-	mb	ci
R. guymeriana N.Snow & J.P.Atwood	br	wi	ax	pu	ir	-	mb	ci
R. kaweaensis N.Snow	br	lr	ax	np	?	?	?	?
R. lanata Guymer	ac	sm	ax	np	st	dmc	sc	c
R. locellata (Guillaumin) Burret	eu	lr	ax	np	st	dmc	sc	c
R. longisepala N.Snow & J.McFadden	ac	sm	ax	np	st	-	sc	c
R. macrocarpa Benth.	eu	lr	pa	np	st	-	mb	ci
R. mengenensis N.Snow	br	?	ax	np	st	-	sc	c
R. misimana N.Snow	ac	sm	ax	?	st	+	sc	c
R. montana Guymer	ac	sm	ax	np	st	-	sc	c
R. novoguineensis Diels	ac	sm	ax	np	st	-	sc	c
R. obovata C.T.White	eu	lr	ax	np	st	+, -	sc	c
R. pervagata Guymer	ac	sm	ax	np	st	-	sc	c
R. pinnatinervis C.T.White	eu	lr	ax	np	st	dmc	?	c
R. psidioides (G.Don) Benth.	eu	lr	ax	?	?	+, -	sc	c
R. salomonensis (C.T.White) A.J.Scott	ac, eu	sm	ax	np	st	dmc	?	c
R. sericea Burret	ac	sm, lr	ax	np	st	-	sc	c
R. surigaoensis Elmer	eu	sm	ax	np	st	dmc	?	c
R. tomentosa (Aiton) Hassk.	ac	lr	ax	np	st	-	sc	c
R. trineura (F.Muell.) F.Muell. ex Benth.	ac	sm	ax	np	st	+, -	sc	c

Fig. 2. ***Rhodomyrtus guymeriana***. Close up of fruit on holotype showing prominent longitudinal wings.

morphology. Scott (1978) indicated that fruits of *R. elegans* could be smooth or have approximately 10 ribs. All of the type specimens for *R. guymeriana*, which Scott (1978) included in *R. elegans*, have nine deep longitudinal ridges, and the furrows between each ridge are flat. The flat furrow, as opposed to having a U- or V-shaped profile, along with the thin but evenly thickened ribs and their height of up to 5 mm above the fruit surface, indicates the ribs may appear more wing-like when fresh, although their prominence may decrease as the fruits increasingly mature and, presumably, become more plump. Longitudinal ribbing in fruits is a homoplastic character state that recurs in many baccate genera of Myrtaceae (e.g. Snow *et al.* 2003, Snow 2007; Salywon & Landrum 2007). Although the ribbing can be weak or only moderate in some species of Myrtaceae (e.g., *Rhodamnia angustifolia* N.Snow & Guymer and *R. dumicola* Guymer & Jessup (Snow 2007)), we are unaware of species in which variation in the cross-sectional shape of fruits ranges from completely lacking in ribs to strongly ribbed. We have re-examined some fruiting specimens cited by Scott (1978) as *R. elegans* (e.g., *Ridsdale NGF31720*, *Streimann & Kairo NGF17479*, both at BISH), which with their globose overall and terete cross-sectional fruit shapes are quite unlike those of *R. guymeriana*, with its fusiform overall shape and nine longitudinal ridges. A further but subtle difference exists between the indumentum of the fruits. Mature fruits of *R. elegans* bear individual and appressed hairs that are less than 0.3 mm long; on older fruits (e.g. *Ridsdale NGF31720*, BISH) the fruit sheds some of its indumentum with increasing maturity. In contrast, individual hairs on the sub-mature fruits of *R. guymeriana* are approximately 0.5 mm long and somewhat

more erect. Finally, the seeds of *R. elegans* (e.g. *Ridsdale NGF31720*, BISH) appear to be arranged haphazardly between the irregularly oriented but relatively thick partitions. This arrangement contrasts with the regular vertical rows (typically 2 per locule in each of 3 locules) separated by thin partitions, typical for the acrodromous species of *Rhodomyrtus*.

***Conservation status*:** In the absence of focused surveys IUCN (2001) guidelines suggest a conservation assessment of "Data Deficient" (DD). Callmander *et al.* (2005), citing the urgent global need for more rapid and effective conservation of plants, presented compelling reasons for avoiding designations of "data deficient", particularly as they relate to tropical taxa, and suggested instead the use of either "threatened/potentially threatened" or "not threatened". One of the more poignant reasons in their view for the latter strategy is that targeted, species-specific field surveys are unrealistic across much of the tropics and have lead to significant underestimates of the percentage of plants worldwide that are threatened. Underestimations of threatened taxa interfere with planning efforts that require knowledge of threatened taxa and an accurate assessment of overall rarity (Callmander *et al.* 2005). The potentially available habitat nearby for *Rhodomyrtus guymeriana* suggests a designation of "not threatened" (IUCN 2001), but because the species has not been collected elsewhere we feel the designation of "Potentially Threatened" following the recommendations of Callmander *et al.* (2005) is more appropriate.

***Etymology*:** The specific epithet honours Dr. Gordon P. Guymer (b. 1953), Director of the Queensland Herbarium (BRI) and fellow student of Australasian Myrtaceae (Guymer & Jessup 1986; Guymer 1988a, b; Snow & Guymer 1999a,b; Snow & Guymer 2001a,b; Snow *et al.* 2003).

Rhodomyrtus longisepala N.Snow et J.McFadden, **species nova** a speciebus ceteris omnibus generis lobis calycis acuminatis, venatione acrodrma distincta, venis trichomatibus moderate usque dense tectis abaxialiter, et a *R. novoguineensi* Diels foliis ad apicem acuminatioribus, lobis calcyis longioribus differt. **Typus:** Papua New Guinea. Morobe Province: Labu Swamp, lowland rainforest on margin of swamp, woodline on landslip, 6º42′S, 146º53′E, 11 July 1989, *W. Takeuchi 4550* (holo: BISH [2 sheets]; iso: BISH [plus spirit], BRI, CANB, NY [2 sheets]).

Shrubs to 3.5 m tall; branches numerous and arching. Bark of main stem unknown. Branchlets rounded, wings lacking; epidermis brownish, becoming fissured, tomentose-villous and reddish-brown (increasingly whitish and tomentose with age), oil glands not visible. Stipules hair-like ("type A" *sensu* Snow *et al.* 2003: 6–7). Petioles 5–6.5 mm, densely tomentose-villous (hairs reddish-brown becoming whitish); adaxial surface flattened. Leaves coriaceous, discolorous, surfaces matt, venation perfect (sometimes imperfect) basal or suprabasal acrodromous. Leaf blades 9.3–14.1 × 2.8–4.5 cm, narrowly elliptic; base cuneate to rounded; apex acuminate and usually somewhat falcate; margin flat to slightly revolute. Adaxial leaf surface (at maturity) with scattered appressed hairs on midvein but otherwise glabrous; midvein impressed, becoming flush distally at apex, secondary veins distinct but tertiary veins faint; oil glands not evident on dried material. Abaxial leaf surface villous, hairs reddish-brown and arising primarily from veins; secondary and tertiary veins raised; intramarginal veins at midpoint of leaf *c.* 0.5 mm from leaf margin; margin flat; oil glands small and sparse but visible when backlit. Inflorescence terminal or mostly axillary, solitary or rarely two per axil; flowers mostly solitary or less frequently in simple cymes or few-flowered racemes; leaf bracts present near apex of peduncle, 16–29 mm long, moderately to densely villous, sometimes acrodromous; peduncles 1–11 mm, densely tomentose-villous (hairs reddish-brown). Bracteoles 2, 4.5–9 mm long, 0.5–1 mm wide (at base), narrowly elliptic, apex attenuate and exceeding base of calyx lobes in flower, densely villous, typically soon deciduous. Hypanthium obconic, 7–10 mm, densely villous (hairs reddish-brown), cross-section round. Calyx lobes 5, lobes free above, distinct in bud, 5–8 mm, narrowly triangular, apex

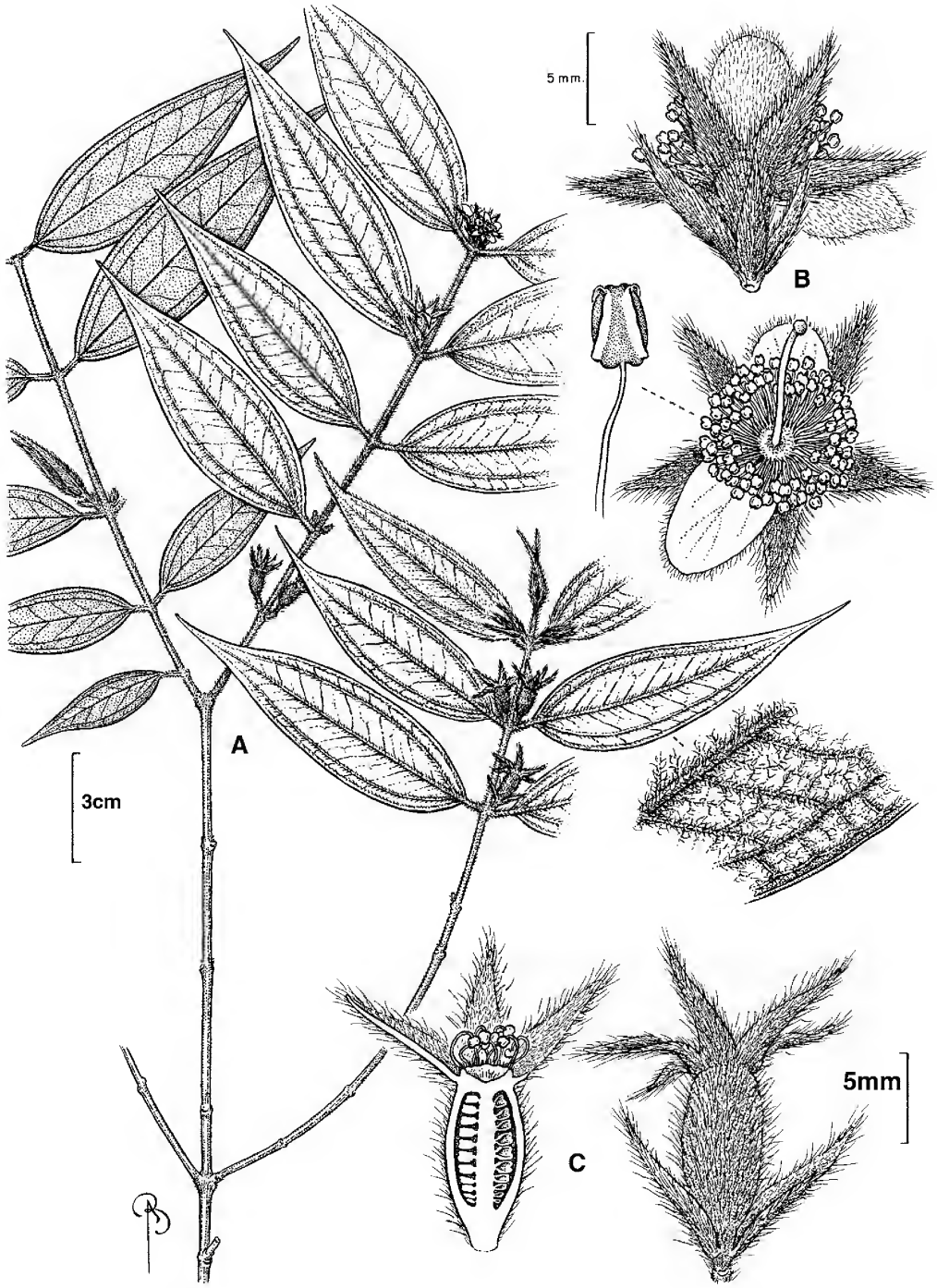

Fig. 3. ***Rhodomyrtus longisepala***. A. Branchlet; abaxial portion of leaf in detail showing indumentum (middle of far right). B. Abaxial (upper figure) and adaxial (lower figure) views of flower with detail of stamens and style. C. Longitudinal section (left) of developing fruit illustrating vertical placement of ovules/young seeds; young fruit illustrating indumentum, bracteoles, and elongate calyx lobes. All from *Takeuchi 4550* (BISH). Del. B. Angell.

acuminate, densely villous above and below (hairs reddish-brown), ascending to erect in fruit. Petals white, 5–7.5 × 4–5.2 mm, ovate to broadly obovate or elliptic, apex rounded to acute, sometimes asymmetric at base; adaxial surface glabrous, sparsely glandular; abaxial surface densely villous throughout. Stamens multiseriate, at least 100 (more accurate counts not possible with existing material); filaments 2–4 mm; staminal disk and ovary disk densely short hairy (hairs whitish); anther sacs subcylindrical, 0.6–0.8 mm, basifixed to sub-basifixed, dehiscing via longitudinal slits, eglandular. Ovary 3-locular, placentation axile, ovules numerous in 2 distinct vertical rows per placenta. Styles *c.* 6 mm, glabrous; stigma somewhat capitate. Fruit baccate, globular to subcylindrical at maturity, rounded at base, 18–19 × 14–16 mm, densely tomentose-villous but becoming nearly glabrous at maturity, reportedly (collection label) white when ripe. Seeds (from point of attachment) broadly obovate to oblate, *c.* 2 mm long; horizontal membranes between seeds lacking (Snow 1999, 2000); testa hard, light yellowish-brown, individual cells increasingly elongated and enlarged distally from point of attachment. Embryos c-shaped. **Fig. 3.**

***Distribution and habitat*:** *Rhodomyrtus longisepala* is known only from the type gathering from the western part of Labu Swamp, from lowland rainforest on the swamp margin west of Lae (**Map 1**). This low-lying area is composed primarily of sediments largely derived from the adjacent Owen Stanley (to the south) and Finisterre (to the north) terranes.

***Phenology*:** Known only at the late-flowering, early-fruiting stage in mid-July. Flowering likely commences at least 2–3 weeks earlier, and mature fruits could be expected to last into early September, if not longer.

***Notes*:** When fresh the leaves are said to be coriaceous, medium green above, and yellowish-green below with a reddish-brown tomentum. According to the collection label the specimen has numerous long and arching branchlets.

On New Guinea, *Rhodomyrtus longisepala* is a close morphological match in many respects for the relatively common *R. novoguineensis*, but the latter has shorter, rounded calyx lobes. Amongst the Australian species, *R. longisepala* somewhat resembles *R. pervagata*, which occurs in northeast Queensland at elevations of 400–1250 metres (Guymer 1991). The latter also generally has rounded (rather than attenuate) calyx lobes, although in *Ford 3295* (BISH) they are somewhat more acute. Likewise, the Australian taxon *R. trineura* may have acute calyx lobes, although they are considerably shorter than those of *R. longisepala*.

This new species was collected as part of anticancer and anti-AIDS screening for the National Cancer Institute (sample numbers Q6607319–R, Q6607320–S, Q6607321–T, Q6607322–U, and Q6607323–V).

***Conservation status*:** Recent satellite imagery suggests the area immediately adjacent to Labu Swamp is little if at all deforested. However, since the species *Rhodomyrtus longisepala* is only known from one gathering the appropriate designation for it is "Potentially Threatened", based on the rationale provided above for *R. guymeriana*.

***Etymology*:** The specific epithet is in reference to the attenuate calyx lobes, which distinguish it from its congeners.

Rhodomyrtus misimana N.Snow, **species nova** *R. montanae* et *R. lanatae* affinis sed foliis subtus non nisi sparsim villosis differt. **Typus:** Papua New Guinea. Milne Bay Province: Misima Island, Mt Oeatau, 26 March 1979, *K. Damas LAE74597* (holo: BISH; iso [n.v.]: A, BRI, CANB, E, K, L, LAE).

Shrubs to trees, 2–14 m tall. Outer bark light brown, thin and papery; inner bark light green, thinly fibrous. Youngest branchlets and leaves densely villous with reddish-brown hairs, the adaxial leaf surfaces becoming increasingly glabrate during ontogeny. Branchlets rounded, wings lacking; densely villous (to somewhat tomentose) with reddish-brown hairs. Stipules of several dark, relatively long setose hair-like structures ("type A" *sensu* Snow *et al.* 2003: 6–7). Petioles 3.5–5 mm, densely

Fig. 4. ***Rhodomyrtus misimana***. Holotype specimen (*Damas LAE74597* [BISH]).

villous with reddish-brown hairs, adaxial surface channeled (but this obscured by dense indumentum). Leaves coriaceous, strongly discolorous (drying dark brown adaxially), surfaces matt, venation perfect, suprabasal acrodromous. Leaf blades (1.7–) 5–9.2 × (1–)1.5–2.5 cm, narrowly ovate, base cuneate to rounded; apex acute to acuminate; margin flat. Adaxial surface indumentum (at maturity) comprised of appressed to somewhat villous hairs along midvein and lateral primary veins (whitish to reddish-brown), becoming less dense proximally; midvein impressed proximally, becoming nearly flush distally, secondary veins faint; oil glands not evident on dried material. Abaxial leaf surface villous, hairs reddish-brown and mostly arising from veins; secondary and tertiary veins prominent and slightly raised; intramarginal veins at midpoint of leaf <0.5 mm from margin; oil glands small but dense. Inflorescence axillary or terminal, flowers 1 or mostly 2 per axil; pedicels 3.5–5.5 mm long, densely villous. Bracteoles 2, very broadly ovate, 2.5–3 mm long, leaf-like, sparsely hairy adaxially, densely hairy abaxially. Hypanthium obconic 3–4.5 mm long, densely villous, cross-section round. Calyx lobes 5, free and distinct in bud, broadly rounded apically, densely villous, *c.* 2.5 mm long. Petals sparsely to moderately villous adaxially, densely villous abaxially (material otherwise limited and only fragmentary). Stamens unknown. Style *c.* 6.5 mm, somewhat hairy proximally. Ovary (from fruit) 3-locular, placentation axile, each locule bearing 2 distinct vertical rows of seeds and thin septal walls. Fruit baccate, 5.5–7 × 4–5 mm (at submaturity), subcylindrical, rounded at base, densely villous becoming less so, reportedly (from collection label) greenish when young, crowned by persistent calyx lobes. Horizontal, thin membranes present between individual seeds (evidently complete or nearly so) (Snow 1999, 2000). Testa sclerotic. Embryos not seen but probably c-shaped based on seed shape. **Fig. 4 & 5.**

***Additional specimen examined*: Papua New Guinea.** Milne Bay Province: Louisiade Archipelago, Misima Island, Mt Oiatau, Mar 1979, *Harrison-Gagné 2155* (BISH).

***Distribution and habitat*:** The new species has been collected at *c.* 800 and 980 metres in montane, mossy forests on Misima Island (**Map 1**), which has a narrow east-west axis approximately 40 km long and 10 km wide at its greatest dimensions. According to Pigram & Davies (1987), Misima Island and the larger southeasterly islands of Tagula, and Rossel (Yela), which are located in the Milne Bay Province, are geological outliers of the Owen Stanley Terrane, which has a much greater expanse as a prominent component of the mountainous areas (some exceeding 3800 metres) along the interface of the Gulf, Morobe, Central, and Northern provinces. These outlying islands are also known as the Louisiade Archipelago, a predominantly volcanic series of islands with associated coral reefs. The collection label of the holotype indicates coordinates of 11°22′S, 154°11′E. However, these coordinates are probably in error, as they fall on Yela (Rossel) Island, which is located some 145 km to the southeast of Misima Island. The holotype of *Rhodomyrtus misimana* was reported previously as a range extension of *R. montana* (Csizmadi 2006: 54).

***Phenology*:** Fruiting (immature) known only in late March. The flowering period likely commences in early February and fruiting may extend through much of April or later.

***Notes*:** The two collections of *Rhodomyrtus misimana* are virtually indistinguishable. The paratype specimen is also from Mt. Oeatau and was collected on the same day (likely as part of the same collecting party).

Rhodomyrtus misimana closely resembles *R. montana*. However, the abaxial indumentum on the leaves of the new species arises from the venation only, and the oil glands are dense and easily visible; in *R. montana* it is densely tomentose-villous throughout the abaxial surface (**Fig. 6**). In addition, *R. misimana* has a matt adaxial leaf surface and predominantly villous indumentum on the branchlets, whereas *R. montana* has a glossy adaxial surface and indumentum on the branchlets that is more tomentose but includes longer, villous hairs. *Rhodomyrtus misimana* occurs from 800–940 metres elevation on Misima Island on Mt Oeatau (as "Oiatau" in some spellings), which is approximately 235 km

east of the southeastern-most part of New Guinea (Papua Peninsula; **Map 1**). In contrast, *R. montana* is restricted to 1900–2300 metres in the Arfak (Mt. Kobreimot) and Nettoti ranges in the Vogelkop Peninsula of Papua Province, Indonesia, approximately 2400 km northeast of Misima Island.

Rhodomyrtus misimana also resembles *R. lanata*. However, the latter species has much larger leaves (6–13.3 cm long [Guymer 1991]) and shares with *R. montana* the densely tomentose-villous abaxial leaf surface. *Rhodomyrtus lanata* occurs mostly in the Morobe and Central Provinces of Papua New Guinea at elevations from 1100–2300 metres, although one collection is known from Sandaun (= West Sepik) Province (*Sayers NGF19502*) (Guymer 1991).

***Conservation status*:** The collection label of the holotype indicates the plant was common when collected in 1979. The species appears to be restricted to an elevational range of approximately 180 metres on one island, and we thus feel the most appropriate designation is "Potentially Threatened" (following rationale cited above for *Rhodomyrtus guymeriana*).

***Etymology*:** The specific epithet reflects the evident endemism of the species to Misima Island.

Discussion

The description of the three new species of *Rhodomyrtus* provides the opportunity to summarise and discuss some of the characters that differentiate species of the genus as it is presently circumscribed **(Table 1),** and to report several character states for the first time. Ignoring polymorphisms and uncertainties contained therein, **Table 1** reveals at least nine permutations of character states among those presented, even though it only partially summarizes character variation in *Rhodomyrtus*. For example, indumentum on petals and stigma shapes have been shown to be of taxonomic utility in *Rhodomyrtus* and related genera (Csizmadi 2006; Snow 2008) but are not reported, since they need additional study. The most common character syndrome shown in **Table 1** occurs in *Rhodomyrtus effusa* and five other species (*R. longisepala*, *R. montana*, *R. novoguineensis*, *R. pervagata*, and *R. trineura*), all of which have acrodromous venation (*sensu* Hickey 1973).

The gelatinous endosperm found in *Rhodomyrtus guymeriana* is the first report for the genus. It is also known for some species of *Gossia* (Snow *et al.* 2003) and has been reported for *Eugenia* (van Wyk & Botha 1984), but is otherwise rare among baccate genera in the family. Other species, especially those with circinate embryos and fibres surrounding the testa (see below), should be re-examined with fresh material for the presence of endosperm.

The circinate embryos of *Rhodomyrtus guymeriana* are shared by *R. elegans* (*Hartley TGH10646* [A]) and *R. macrocarpa* (*Brass 33718* [QRS], *Smith 112392* [BISH]). The embryos of these three species are also densely but minutely glandular. Among the baccate genera of Myrtaceae, circinate embryos are known also in *Gossia* (Snow *et al.* 2003), *Campomanesia* Ruiz & Pav., and *Blepharocalyx salicifolius* (H.B.K.) O.Berg (Landrum & Kawasaki 1997). Species of *Rhodomyrtus* possessing circinate embryos also have a membranous testa (details below) and either eucamptodromous or brochidodromous venation; the distinction between venation types was not recognized previously for the genus (e.g. Csizmadi 2006; Snow 2006). Re-analysis of the leaf venation pattern of *R. surigaoensis* indicates a type somewhat intermediate between acrodromous and brochidodromous. Snow (2007) similarly reported limitations of the use of leaf venation typologies for some species of *Rhodamnia*.

At least two of the three newly described species have membranous outer testal layers (*Rhodomyrtus elegans* and *R. guymeriana*) that also exhibit a type of testal morphology previously unreported for the genus, and which may represent a first report for Myrtaceae. This form possesses several layers of parallel, tightly packed, relatively long fibres that are tightly appressed to the outer testa (*R. guymeriana* [isotype, K] and *R. elegans* [*Ridsdale NGF31720*, BISH]). The fibres are oriented radially across the more or less circular seed and collectively impart a thickly

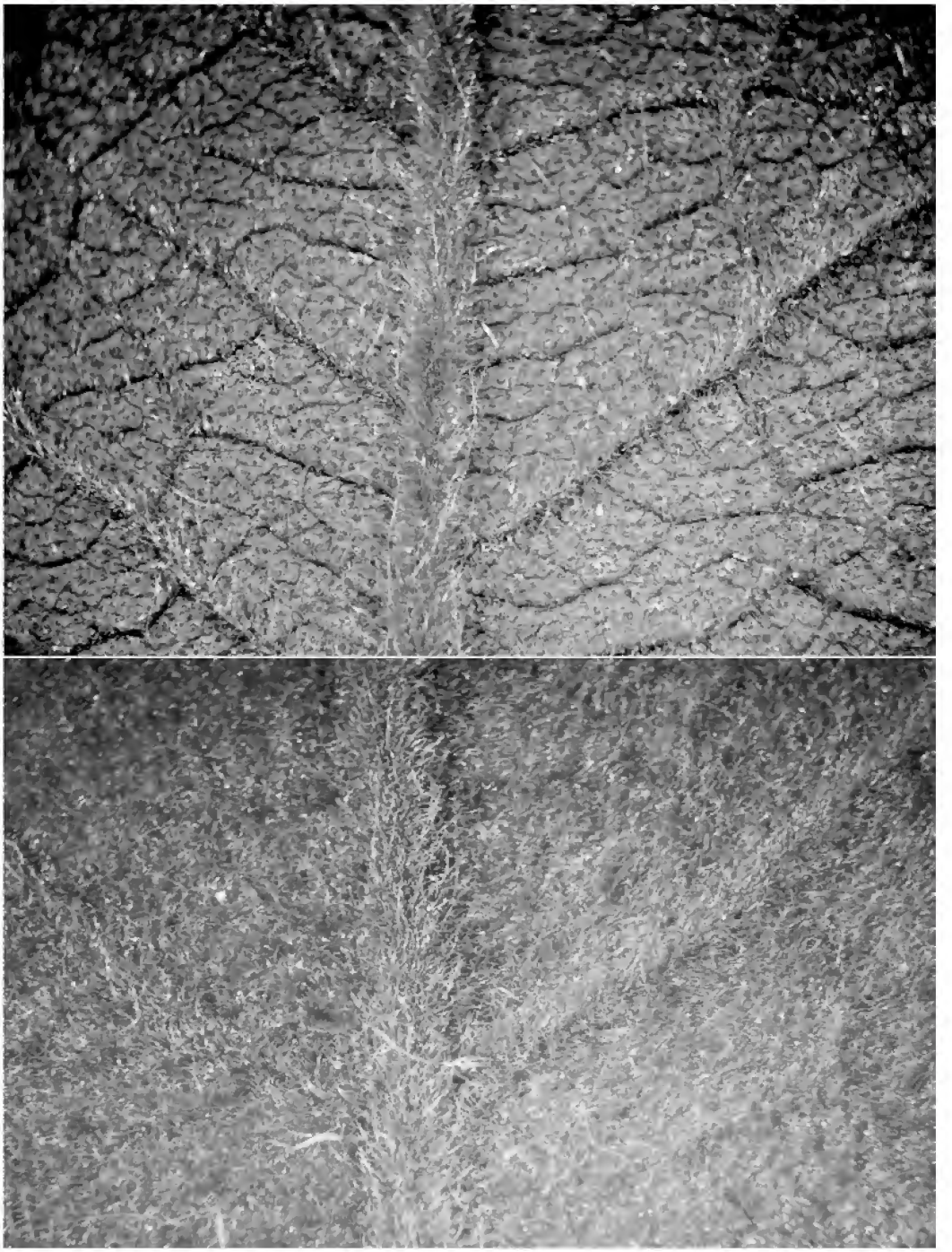

Fig. 5. Close-up of abaxial leaf surfaces highlighting differences in density of indumentum. Upper half: ***Rhodomyrtus misimana***, holotype (*Damas LAE74597* [BISH]); Lower half: ***Rhodomyrtus montana***, *Sleumer & Vink BW14152* (BISH).

membranous texture to the seed. The fibrous testa surrounds a much thinner membranous layer that lies adjacent to the embryo. These non- or only weakly sclerified fibres may represent a transitional evolutionary stage between a membranous testa and sclerotic testa, the latter of which is common in many genera of the Myrteae (Wilson *et al.* 2005; which also has been known widely as subtribe Myrtinae [e.g., Landrum & Kawasaki 1997; Landrum & Sharp 1989]).

The presence of a membranous testa, as seen in three species of *Rhodomyrtus* **(Table 1)** is of interest because few genera in the Myrteae (*sensu* Wilson *et al.* 2005) from Australasia or those from the neotropics (Landrum & Kawasaki 1997) share this character state. The mostly Australian genus *Pilidiostigma* has a leathery testa (Snow 2004), and the recently erected monotypic Brazilian genus *Curitiba* Salywon & Landrum has a coriaceous testa (Salywon & Landrum 2007). Among species of *Rhodomyrtus* those with a membranous testa have either brochidodromous or eucamptodromous leaf venation. Preliminary DNA sequence analyses using sequences from ITS-1 and ITS-2 that sampled broadly in *Rhodomyrtus* and putatively related genera have placed *Pilidiostigma* near (and in one case sister to) a clade that included many (but not exclusively) species of *Rhodomyrtus* having brochidodromous venation and a membranous testa (Csizmadi 2006: 31; Salywon *et al.* in prep.). The results of Wilson *et al.* (2005; Fig. 1 therein) using DNA sequences from *mat*K also suggested a close phylogenetic relationship between the eucamptodromous-veined species *R. macrocarpa* Benth. and *Pilidiostigma*, although their sampling regime was limited within genera.

Another character reported here for the first time among the baccate genera of Myrtaceae (to the best of our knowledge) is large, dark maroon-coloured cells (as observed on dried fruits that have been cut in trans-section), which are tightly adherent to the outer wall of the seed coats (e.g. in *Rhodomyrtus locellata*, *R. pinnatinervis*, *R. salomonensis*, and *R. surigaoensis*). The large cells are easily visible without magnification and leave visible pits in the surface of the testa, suggesting the large cells assume their shape prior to the sclerotization of the outer testal cells. Species of *Rhodomyrtus* with the enlarged dark maroon cells all have eucamptodromous venation, apart from *R. surigaoensis*, whose venation is intermediate between eucamptodromous and acrodromous.

Species of *Rhodomyrtus* with axile placentation (all but *R. macrocarpa*) typically have one of two types of seed arrangement. In most species the seeds are stacked like poker chips in two regular rows per ovule, with little if any pulpy tissue between the seeds (e.g., as per *Psidium guajava* L.); this group includes the type of the genus, *R. tomentosa* (e.g. *Fosberg 37709*, BISH). In contrast, species such as *R. guymeriana* and *R. elegans* have seeds irregularly embedded in a juicy, pulpy matrix in which the seeds are separated by somewhat irregularly oriented partitions. *Rhodomyrtus macrocarpa* differs from all other species in the genus by its parietal placentation and unilocular carpels, although its eucamptodromous venation and membranous testa bearing radial fibres on the outer-most layers suggest a close relationship with *R. psidioides* and *R. elegans*. The character variation **(Table 1)** for fruiting material was derived mostly from dried material, and additional studies using fresh material with larger sample sizes are not only needed, but may require some of the information herein to be amended.

With the description of these three new species, the number of species now known for *Rhodomyrtus s. lat.* is 22, a figure approximately double that of earlier reports (Scott, 1978; Snow 2000). *Rhodomyrtus trineura* (Guymer 1991) and *R. tomentosa* (Scott 1978) have each been recognized as having infraspecific taxa, raising the total number of taxa in the genus to as high as 24. Additional collections at BISH and elsewhere suggest that one or more additional new species of *Rhodomyrtus* may await description from New Guinea, but better reproductive material must be seen first.

With 13 species, the island of New Guinea has the highest diversity of *Rhodomyrtus*, compared to seven species in Australia.

Rhodomyrtus macrocarpa occurs in both areas (New Guinea comprises Papua New Guinea and Papua Province of Indonesia) (Snow 2006). (Note: "*Rhodomyrtus longipetiolata*" [Snow 2006: 338] should have read *Gossia longipetiolata* N.Snow.) Of the five species of *Rhodomyrtus* described recently (Snow 2006 and herein), four are known only from the type gathering. Given that many regions of New Guinea harbor localized endemic species of vascular plants (van Welzen 1995) and that much of the island remains barely if at all surveyed (Stevens 1989; Conn 1994; Takeuchi 2007), we predict that further exploration will reveal additional novelties in *Rhodomyrtus*.

As reported previously, *Rhodomyrtus* is demonstrably polyphyletic based on morphology (Snow 1999, 2000) and ITS-1 and ITS-2 sequence data (Csizmadi 2006; Snow 2006). The genus almost certainly will be split in the future pending additional data. Given the acrodromous leaf venation of *R. tomentosa* (the type species of the genus) and *R. longisepala* and *R. misimana*, and aspects of their fruit and seed morphology, it seems unlikely the latter two taxa will require name changes. In contrast, the brochidodromous venation in *R. guymeriana*, coupled with some aspects of its fruit morphology, suggest it may require a new generic combination in the future along with several other species in the genus. Future studies of *Rhodomyrtus* should sequence additional molecular markers and carry out detailed analyses of floral and fruiting morphology using fresh material. However, before *Rhodomyrtus* is split into (presumably) two or more monophyletic genera, additional sequencing and morphological studies also are needed for the putatively related genera *Archirhodomyrtus* Burret, *Octamyrtus* Diels, and *Kanakomyrtus* N.Snow (Snow 2008).

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We thank curators at A, BRI, CANB, K, L, NY, QRS and US for loaning material or access to specimens. For *R. longisepala* we extend our appreciation to Lyn Craven (CANB) for the Latin diagnosis and Bobbi Angell for the beautiful illustration. Laura Jennings and Eve Lucas (K) provided assistance with specimens and permission to dissect a fruit. Peter Wilson (NSW) graciously read the manuscript before its submission and suggested several improvements. Peter Bostock (BRI) provided the blank map for PNG for Map 1. Mahalo to Arnold Hori (BISH) for providing some of the digital images herein. The description of *R. longisepala* represents a portion of a M.Sc. thesis (Csizmadi 2006) submitted to the University of Northern Colorado by J.M., who graciously acknowledges support at UNC from the Albert M. Winchester, Robert Sund, Richard and Chris Monfort, Cross Family, and Gerald D. Schmidt awards. The internship of J.P.A. at the Bishop Museum was supported by a NSF grant (IGERT 0504103) to Peter August, University of Rhode Island Coastal Institute. N.S. thanks William and Christiane Anderson (MICH) for assistance interpreting the correct generic authorship of *Rhodomyrtus*.

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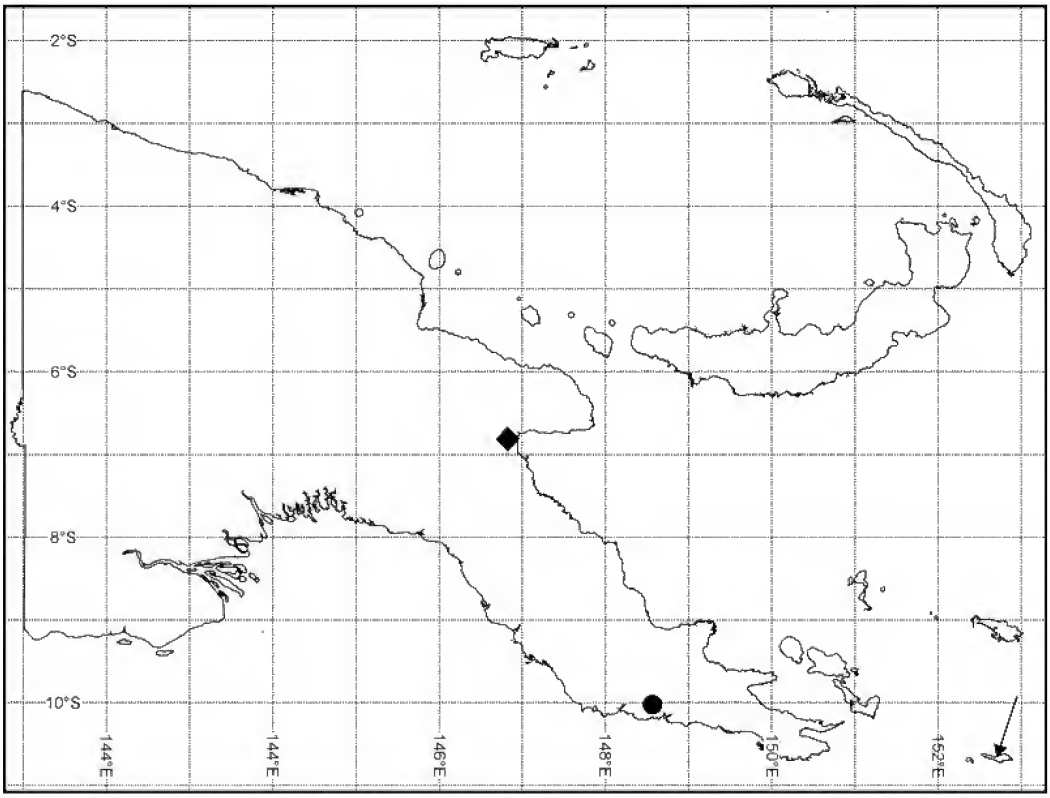

Map 1. Distribution of three new species of *Rhodomyrtus* from Papua New Guinea. *R. guymeriana* ●; *R. longisepala* ◆ ,and *R. misimana* (←, lower right).

Plectranthus batianoffii P.I.Forst. (Lamiaceae), a new species from north-east Queensland

Paul I. Forster

Summary

Forster, P.I. (2008). *Plectranthus batianoffii* P.I.Forst. (Lamiaceae), a new species from north-east Queensland. *Austrobaileya* 7(4): 707–710. A new species (*Plectranthus batianoffii* P.I.Forst.) known from several continental islands in north-east Queensland is described and illustrated. A conservation status of Vulnerable is recommended.

Key Words: Lamiaceae, *Plectranthus batianoffii*, new species, Australian flora, Queensland flora

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Introduction

The genus *Plectranthus* is highly diverse in Australia with at least thirty-five described species (Blake 1971; Forster 1992, 1994, 1996, 1997, 1999). As noted previously (Duretto & Forster 2007), speciation in the genus has occurred where populations occur in isolated areas such as mountain peaks or ranges and where suitable habitat exists on areas of exposed rock pavements and outcrops. This suite of habitat factors has resulted in the "islands on islands" effect (Porembski *et al.* 2000) and is widely recognized as being a driving force in genetic diversity and speciation (Carlquist 1974; Grant 1981; Hopper 2000; Seine *et al.* 2000). The rapid maturation of *Plectranthus* individuals from seed (one growing season) with the potential for repeated generation turnover is thought to enable relatively rapid speciation within a given locality once new genetic changes arise in a population.

Accumulation of a number of field collections, together with a critical examination of previously described taxa and herbarium collections, now enable a further new species to be named. The new species has a restricted distribution on several offshore continental islands in north-east Queensland.

Accepted for publication 15 September 2008

Materials and methods

This paper is based on collections in Australian herbaria, particularly BRI and QRS. Live material of *Plectranthus batianoffii* was cultivated for nearly 20 years in Brisbane enabling observation of variation under different ecological conditions.

Taxonomy

Plectranthus batianoffii P.I.Forst., **species nova** *P. foetido* Benth. affinis, sed habitu suffruticis decumbentis usque ad 30 cm altitudine non fruticiformi usque ad 2 m altitudine, foliis vix odoratis non valde aromaticis, pagina inferiore folii laminae trichomatibus antrorsis non-glandularibus (adversum divaricatis vel retrorsis) praedita, verticillastris flores plures (12–18 non 6–11) ferentibus differens. **Typus:** Queensland. Cook District: Palfrey Island, 14°42′S, 145°28′E, 23 July 1990, *G.N.Batianoff 12118* (holo: BRI [1 sheet]).

Prostrate to semi-erect herb to subshrub up to 30 cm high; foliage with ± no scent when crushed, slightly clammy; non-glandular and glandular trichomes clear to purplish, sessile glands 8-celled and orange. Roots fibrous. Stems ± square, erect to straggling, succulent, the lower parts up to 10 mm diameter, grey-green, non-glandular trichomes sparse, antrorse, 6–10-celled up to 2 mm long, glandular trichomes scattered, sessile glands scattered. Leaves discolorous, petiolate; petioles 5–18 mm long, 3–4 mm wide, weakly channelled above, non-glandular trichomes

dense, antrorse, 6–12-celled up to 3.2 mm long, glandular trichomes absent, sessile glands scattered; lamina broadly ovate to triangular, ± succulent, 30–60 mm long, 30–50 mm wide, crenate with 15–19 teeth up to 2 mm long on each margin, widest above middle, secondary teeth usually present; tip acute; base truncate; upper surface grey-green, veins impressed and velutinous, non-glandular trichomes dense, divaricate to antrorse, 6–12-celled up to 1.5 mm long, glandular trichomes absent, sessile glands absent; lower surface silver-green, veins raised and velutinous, non-glandular trichomes dense, antrorse, 6–12-celled up to 2 mm long, glandular trichomes absent, sessile glands dense. Inflorescence up to 200 mm long, comprising 1–3 pedunculate branches from near the base; verticillasters 12–18-flowered, up to 8 mm apart; pedicels 1.6–1.8 mm long, *c.* 0.3 mm diameter, non-glandular trichomes sparse, antrorse, 6–8-celled up to 1 mm long, glandular trichomes scattered, sessile glands absent; cymes sessile; axis square in cross-section, non-glandular trichomes sparse, antrorse, 6–12-celled up to 2 mm long, glandular trichomes absent, sessile glands scattered; bracts broadly-ovate, 1.6–1.8 mm long, 2–2.2 mm wide, not forming a coma, non-glandular trichomes sparse, antrorse, 6–10-celled up to 1 mm long, glandular trichomes absent, sessile glands sparse. Flowering calyx 3.2–3.5 mm long, non-glandular trichomes dense, antrorse, 6–8-celled up to 1.2 mm long, glandular trichomes scattered, sessile glands sparse. Fruiting calyx 3.8–4.5 mm long; upper lobe obovate to ovate, 2–2.5 mm long, 1.8–2.2 mm wide; lateral lobes lanceolate, 1.9–2.2 mm long, 0.6–0.8 mm wide; lower lobes lanceolate-falcate, 2–2.3 mm long, 0.5–0.7 mm wide. Corolla 8.5–10 mm long, pale lilac; tube 4.5–5.5 mm long, weakly curved at 110–120° 2–2.5 mm from base, slightly inflated upwards, glabrous or with non-glandular trichomes scattered, divaricate, 2–4-celled to 0.3 mm long; upper lobes suborbicular, recurved, 1.7–1.9 mm long, 1.6–2 mm wide, non-glandular trichomes sparse, divaricate, 2–4-celled up to 0.4 mm long, glandular trichomes absent, sessile glands sparse; lateral lobes oblong, 1–1.2 mm long, 0.5–0.7 mm wide, non-glandular trichomes absent, glandular trichomes absent, sessile glands scattered; lower lobe broadly ovate, 3.2–4.5 mm long, 3.5–4 mm long, non-glandular trichomes sparse, divaricate, 2–6-celled up to 0.5 mm long, glandular trichomes absent, sessile glands scattered. Filaments filiform, 7–8 mm long, *c.* 0.3 mm diameter, lilac, fused for 4–5 mm from base; anthers *c.* 0.4 mm long and 0.3 mm wide. Style filiform, 7–8 mm long, lilac, bifid for *c.* 0.3 mm. Nutlets ± circular in outline, ± flattened, *c.* 0.9 mm long, 0.8 mm wide and 0.5 mm thick, smooth, glossy brown. **Fig. 1.**

***Additional specimens examined*: Queensland.** Cook District: Stanley Island, Jun 1995, *Le Cussan 606* (BRI); [all subsequent collections from Lizard Island] Oct 1967, *Heatwole 75* (BRI); Jul 1969, *Heatwole s.n.* (BRI [AQ007940]); Dec 1974, *Specht LI218 & Specht* (BRI); Dec 1974, *Specht LI416 & Specht* (BRI); Sep 1988, *Batianoff 10216* (BRI); Jul 1990, *Batianoff 12087* (BRI, MEL). Cultivated: Indooroopilly (ex Lizard Island), Nov 1994, *Forster 15894* (BRI).

***Distribution and habitat*:** *Plectranthus batianoffii* has been found only on Lizard, Palfrey and Stanley Islands on the north-east Queensland coast. Plants occur on granite outcrops and pavements or occasionally in boulder strewn grassland.

***Notes*:** *Plectranthus batianoffii* was first collected in 1967 by Hal Heatwole; however, the taxonomic identity of the plants was not questioned until the late 1980s when George Batianoff first collected material.

On the basis of gross morphology, the most obvious allied species to *Plectranthus batianoffii* appears to be *P. foetidus* Benth. which is distributed to the south of Lizard and Palfrey Islands. The new species differs from *P. foetidus* by the decumbent subshrub habit to 30 cm high (versus a shrub up to 2 m tall), the barely scented foliage (versus strongly aromatic), the lower surface of the leaf lamina with antrorse non-glandular trichomes (versus divaricate to retrorse) and the vertillasters with more flowers (12–18 versus 6–11).

***Etymology*:** The specific epithet honours George N. Batianoff, botanist at the Queensland Herbarium and specialist on Queensland's island floras.

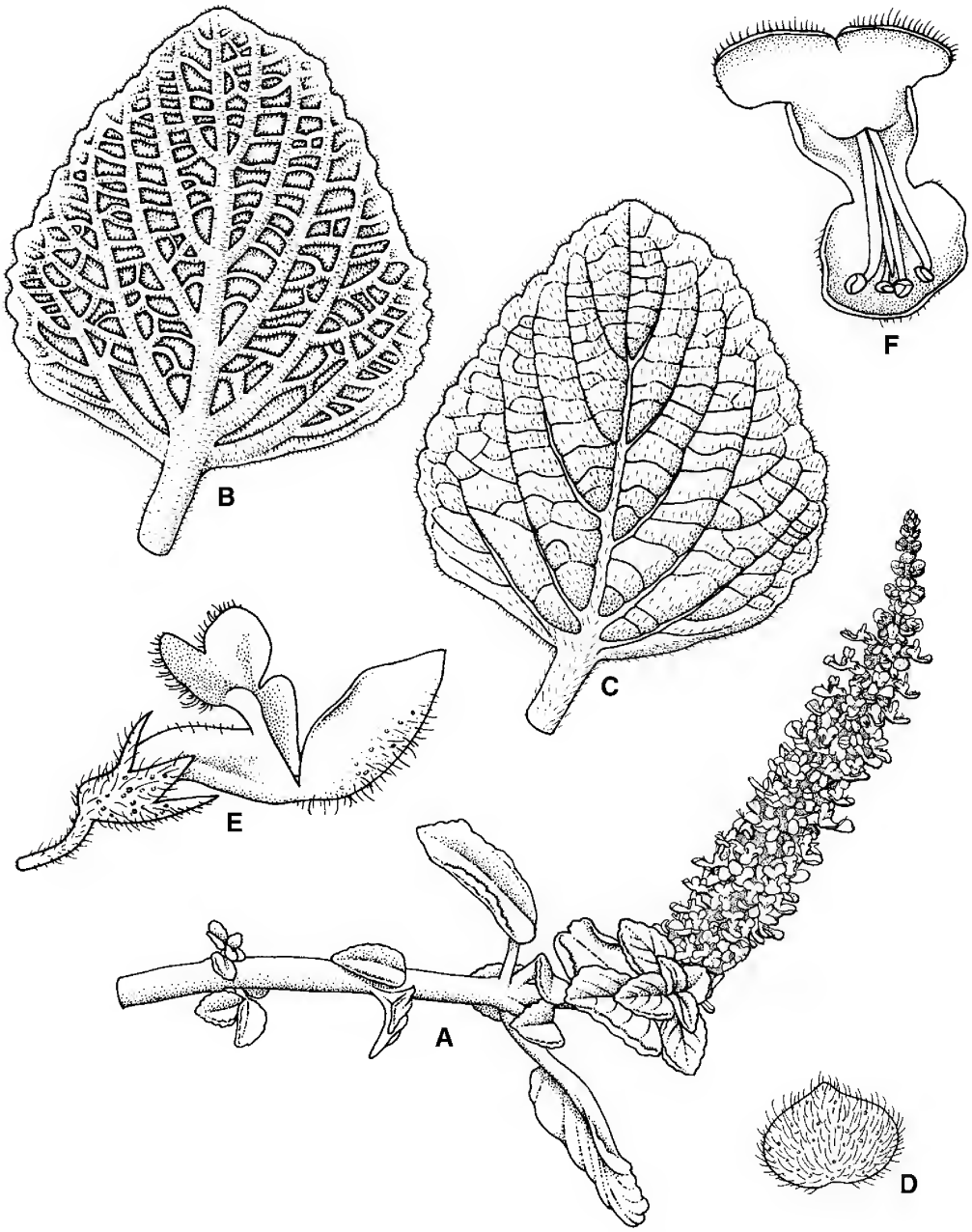

Fig. 1. ***Plectranthus batianoffii***. A. flowering stem × 0.5. B. abaxial view of leaf × 1.5. C. adaxial view of leaf × 1.5. D. inflorescence bract × 6. E. lateral view of flower × 6. F. face view of flower × 6. All from *Forster PIF15894* (BRI). Del. W. Smith & B. Connell.

***Conservation status*:** *Plectranthus batianoffii* is known from three populations, all situated on rather small offshore islands. The species can be assessed as Vulnerable on the criterion D2 (IUCN 2001).

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Huperzia tetrastichoides A.R.Field & Bostock (Lycopodiaceae) a newly recognised species of tassel fern from the Wet Tropics of Queensland, Australia

Ashley R.Field[1] & Peter D.Bostock[2]

Summary

Field, A.R. & Bostock, P.D. (2008). *Huperzia tetrastichoides* A.R.Field & Bostock (Lycopodiaceae), a newly recognised species of tassel fern from the Wet Tropics of Queensland, Australia. *Austrobaileya* 7(4): 711–715. An Australian endemic species of tassel fern *Huperzia tetrastichoides* A.R.Field and Bostock is described as new. This species was previously confused with the non-Australian species *Huperzia prolifera* (Blume) Trevis. The new species is restricted to upland Queensland rainforests from the Windsor Tableland south to the Clarke Range west of Mackay. It is listed as Vulnerable under the *Queensland Nature Conservation Act 1992*. A dichotomous identification key to the Australian species of *Huperzia* is provided.

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Key Words: *Huperzia*, *Lycopodium*, *Huperzia prolifera*, *Huperzia tetrastichoides*, tassel-fern, Lycopodiaceae

Introduction

Huperzia Bernh. is the largest genus of the Lycopodiaceae, an ancient and cosmopolitan plant family (Ollgaard 1987). Twelve species of *Huperzia* have been recorded in Australia (Bostock & Holland 2007). Ten of these species are epiphytic or epilithic in rainforests in the Queensland tropics (Chinnock 1998). Following examination of living plants and herbarium specimens from Asia and Australia we have concluded that the entity hitherto recognised as *Huperzia prolifera* (Blume) Trevis. (*sensu* Andrews 1990; Chinnock 1998; Goodger *et al.* 2008) in Australia is not conspecific with that Malesian species (Blume 1828) (photos of lectotype sheets at Leiden L0057380 and L0057381 seen). It is described in this paper as a new species and considered to be endemic to Australia.

Materials and methods

This study is based on field observations and collections in north Queensland and Malaysia, together with examination of herbarium collections at BRI, CANB and CNS (formerly QRS).

Accepted for publication 23 September 2008

Taxonomy

Huperzia tetrastichoides AR.Field & Bostock, **species nova** antea *H. prolifera* confusa, a qua microphyllis triangulari-ovatis, carinatis et orthostichis in seriebus quatuor (non lineari-lanceolatis, ut minimum lycophyllis planis et microphyllis omnibus heterostichis) differt; ad H. tetrasticham arctissime accedit, a qua lycophyllis ad angulum 20–50° patentibus non aequaliter adpressis et imbricatis differt. **Typus:** Queensland. Cook District: Millaa Millaa Falls, Atherton Tableland, 14 June 2004, *A.R.Field and O.Rawlins 1139* (holo: BRI; iso: CNS, distribuendi).

Sporophyte: Epiphytic herbaceous plant with indeterminate isodichotomous pendulous shoots arising from a tufted root system. Lycophylls and sporophylls subopposite, decussate, orthostichous in four rows. Lycophylls triangular-ovate, carinate, thin but firm, 5–12 mm long, 2–6 mm wide, in basal sterile divisions diverging 20°–50° from stem, gradually transforming to adpressed, imbricate sporophylls in sharply quadrangular terminal fertile divisions. Sporophylls triangular, carinate, thin but firm, 4–6 mm

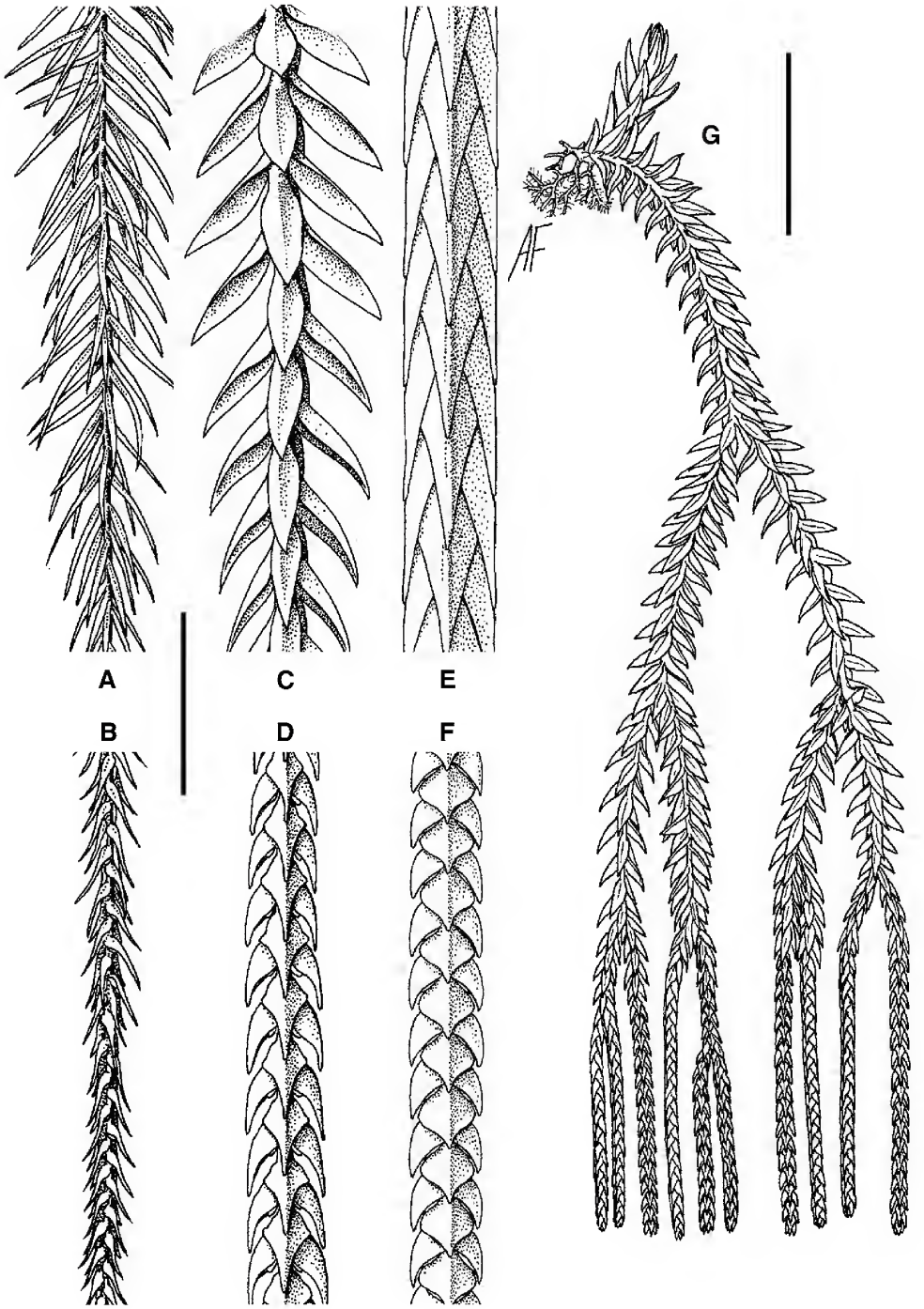

Fig. 1. ***Huperzia prolifera.*** A. infertile shoot section and B. fertile shoot section; ***Huperzia tetrastichoides.*** C. infertile shoot section and D. fertile shoot section; ***Huperzia tetrasticha.*** E. infertile shoot section and F. fertile shoot section ; A–F scale bar = 2 cm; ***Huperzia tetrastichoides.*** G. habit showing isodichotomous pendant branching, carinate sterile lycophylls and sporophylls, lycophylls arranged in four rows and quadrangular strobili; G scale bar = 5 cm. A & B from scan of L57380 and L57381; C & D, G from *Field ARF1139* (BRI); E & F from *Field ARF0815* (BRI). Del. A. Field.

long, *c.* 3 mm wide at base. Sporangia *c.* 2 mm in diameter, each completely concealed by its subtending sporophyll. Stems pale green, lycophylls and sporophylls usually dull dark green. **Gametophyte:** unknown.

***Additional specimens examined* [precise localities withheld]: Queensland.** Cook District: Mossman, May 2004, *Field ARF723, Lloyd & Toh* (BRI); NW of Julatten, May 1989, *Jones 4266 & Clements* (BRI, CANB); Rumula, Oct 2004, *Field & Field ARF826* (BRI); Black Mt, Jul 1999, *Jago 5307, Wannan & Worboys* (BRI). North Kennedy District: Koombooloomba, Feb 2003, *Gray 8439* (CANB); Paluma, Apr 2003, *Field ARF613 & Cairns* (BRI). South Kennedy District: Eungella, Jan 1994, *Pollock 127 & Pearson* (BRI); Eungella, Feb 2005, *Field ARF888 & Field* (BRI); Crediton, Jun 2001, *Ford AF2871* (BRI, QRS).

***Distribution and habitat*:** *Huperzia tetrastichoides* is an uncommon canopy epiphyte of upland notophyll vineforest from Mt Finnigan at *c.* 15°50'S, south to the Clarke Range west of Mackay at *c.* 21°S (**Map 1**). It is most prevalent on the Evelyn, Atherton and Mt Carbine Tablelands and descends to lower altitudes in Mossman Gorge. No specimens have been recorded from outside Australia thus it is considered endemic to the Wet Tropics of Queensland.

***Notes*:** *Huperzia tetrastichoides* has carinate, triangular to ovate microphylls that are orthostichous in four rows, whereas *H. prolifera* has mostly flat, linear to lanceolate, heterostichous microphylls (**Fig. 1A–B, G**). *Huperzia tetrastichoides* resembles the Malesian species *Huperzia tetrasticha* (**Fig. 1E–F**) but differs from it by having divergent rather than uniformly adpressed, imbricate lycophylls (**Fig. 1C–D**). *Huperzia tetrastichoides* resembles the endemic Australian species *Huperzia marsupiiformis* (D.L.Jones & B.Gray) Holub and *Huperzia lockyeri* (D.L.Jones & B.Gray) Holub. It differs from *Huperzia marsupiiformis* by having carinate, triangular-ovate, acutely pointed lycophylls rather than flat, oval, blunt lycophylls and from *H. lockyeri* by having carinate not flat lycophylls and by strobili that are quadrangular throughout rather than terete in some parts.

***Conservation status*:** Currently listed as vulnerable under the Queensland *Nature Conservation Act* 1992.

***Etymology*:** The specific epithet reflects the similarity of this species to *Huperzia tetrasticha*; it is formed from the epithet *tetrasticha* based on the Latin *tetra,* four of, and *stichos*, a row or line of things, and the suffix *-oides,* like or resembling.

***Common name*:** This species is commonly known as the 'bootlace tassel fern' or the 'Queensland square tassel fern' in the nursery trade.

Key to Australian *Huperzia*

1	Plants with erect fertile shoots	2
1.	Plants with pendant or nodding fertile shoots	3
2	Lycophylls entire; bulbils present in lycophyll axils	**H. australiana**
2.	Lycophylls serrate; bulbils lacking	**H. serrata**
3	Shoots homophyllous; sporophylls spreading widely	4
3.	Shoots heterophyllous; sporophylls adpressed	5
4	Shoots glaucous blue grey; lycophylls lanceolate	**H. dalhousieana**
4.	Shoots glossy green; lycophylls linear-lanceolate	**H. squarrosa**
5	Strobili 1–2 mm thick	6
5.	Strobili 3–5 mm thick	7
6	Lycophylls sessile, decurrent in four distinct rows	**H. phlegmarioides**
6.	Lycophylls petiolate, not decurrent in four distinct rows	**H. phlegmaria**

7 Lycophylls thin and linear, margins minutely serrate . . . . . **H. filiformis**
7. Lycophylls lanceolate to ovate, margins entire 8

8 Lycophylls carinate or cupped in cross section 9
8. Lycophylls flat in cross section 10

9 Basal lycophylls triangular-ovate, arranged in four rows; lycophylls and sporophylls thin and coriaceous . . . . . **H. tetrastichoides**
9. Basal lycophylls lanceolate, arranged in more than four rows; lycophylls and sporophylls thick and succulent . . . . . **H. carinata**

10 Lycophylls with obtuse apices . . . . . **H. marsupiiformis**
10. Lycophylls with acute apices 11

11 Sporophyll apices attenuate and spreading; stems fleshy . . . . . **H. lockyeri**
11. Sporophyll apices obtuse to acute and recurved; stems woody . . . . . **H. varia**

Acknowledgments

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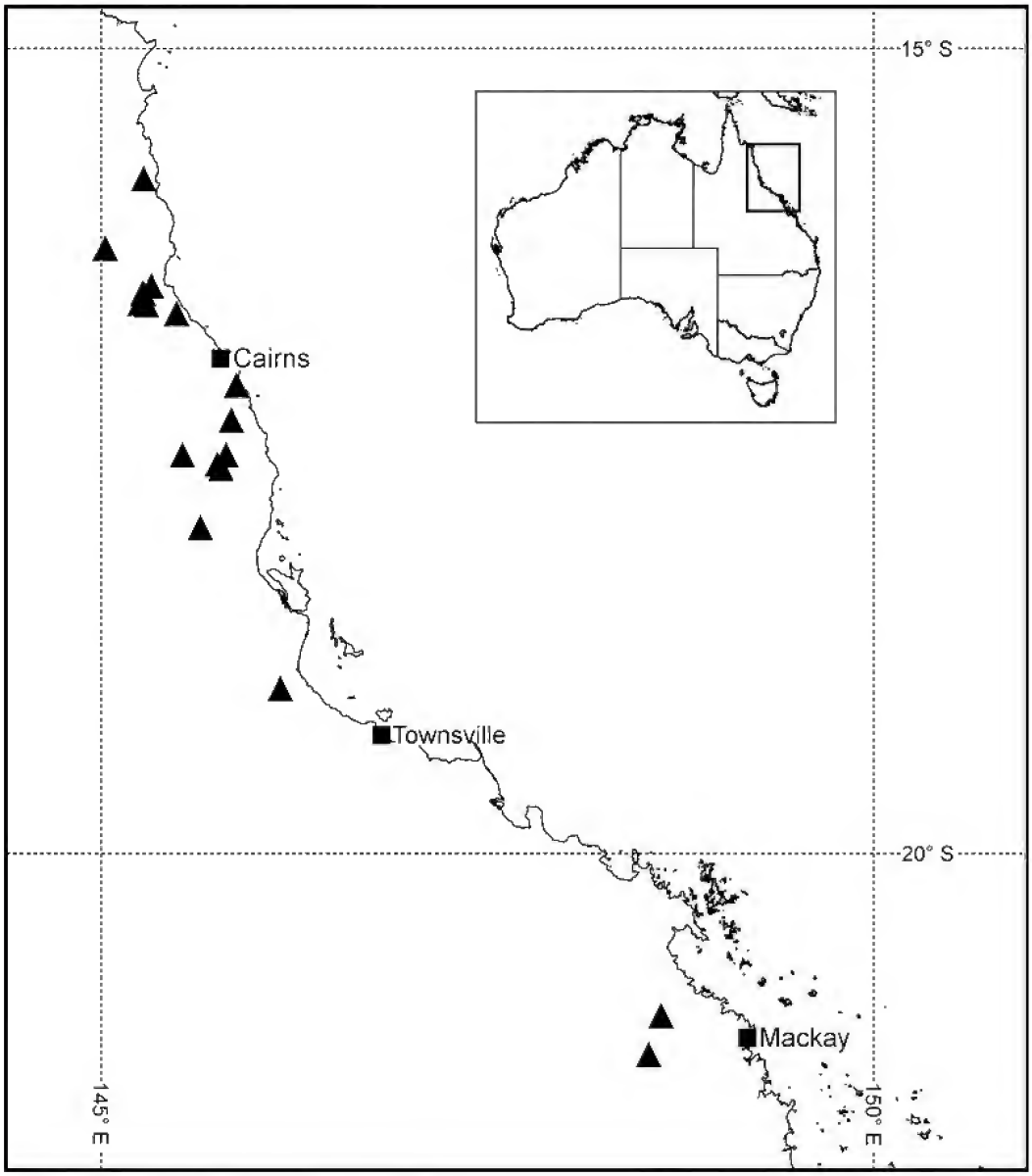

Map 1. Distribution of *Huperzia tetrastichoides* ▲.

Corsia dispar D.L.Jones & B.Gray (Corsiaceae), a new species from Australia, and a new combination in *Corsia* for a New Guinea taxon

David L. Jones[1] & Bruce Gray[2]

Summary

Jones, D.L. & Gray, B. (2008). *Corsia dispar* D.L.Jones & B.Gray (Corsiaceae), a new species from Australia, and a new combination in *Corsia* for a New Guinea taxon. *Austrobaileya* 7(4): 717–722. *Corsia* Becc., a highly specialised monocotyledonous genus, has been recorded from Australia for 40 years; however, the single known species has not been previously studied in detail, nor formally described. The new species *C. dispar* D.L.Jones & B.Gray is named and illustrated and notes on its taxonomy and ecology are provided. *Corsia wiakabui* (Takeuchi & Pipoly) D.L.Jones & B.Gray is newly recognised at specific rank, based on *C. purpurata* L.O.Williams var. *wiakabui* Takeuchi & Pipoly.

Key Words: Corsiaceae, *Corsia*, *Corsia dispar*, *Corsia purpurata* var. *wiakabui*, *Corsia wiakabui*, new species, new combination, Queensland flora, Australian flora, New Guinea flora

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Introduction

Corsia Becc. is a genus of about 25 species developed primarily in New Guinea where there are *c.* 23 species; two others occur in the Solomon Islands and a solitary species is recorded for northern Australia (Van Royen 1972). Somewhat orchid-like, and often mistaken for a member of that group of plants, they can be immediately distinguished by the presence of a ring of stamens surrounding a more or less central style. The stamens are connate basally and with the style form a partially united structure. They are not fully fused, unlike the gynostemium in Orchidaceae. Additionally their pollen grains are free and not coherent to form pollinia (Rudall & Eastman 2002).

Species of *Corsia* are seasonally deciduous, mycoheterotrophic terrestrial herbs which are usually discovered by accident rather than design. They grow in high rainfall montane forests where there is an accumulation of surface litter. Most species grow in areas of difficult access, have a short or limited flowering period, are only above ground when flowering or fruiting, and their life cycle is intimately associated with periods of heavy rainfall. The majority of species appear to be narrow endemics with a restricted range. In fact Van Royen (1972) notes that in New Guinea "almost every mountain range seems to have its own species". All species are generally so elusive and difficult to see in the gloomy surroundings where they grow, that they are undoubtedly under collected, although occasionally they have been observed to be locally abundant (Cribb 1985).

The Australian species of *Corsia* was first collected by Bruce Gray in 1968 and identified to generic level by Jim Willis at MEL. Correspondence by the senior author with Pieter Van Royen established that it was an undescribed species with affinities to *C. unguiculata* Schltr. from New Guinea, but with a number of distinctive features which readily separated it from all New Guinea taxa. Van Royen (1972) placed all the then known taxa in two sections, both of which he described.

The family Corsiaceae has traditionally been grouped with Burmanniaceae and Thismiaceae in the Burmanniales (Dahlgen *et al.* 1985); however, a phylogeny inferred from

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large-subunit (26S) ribosomal DNA sequences suggests that the order Burmanniales is polyphyletic (Neyland 2002). A second similar phylogenetic study also suggests that the Corsiaceae is polyphyletic and provides compelling evidence for the inclusion of *Corsia* within the Liliales (Neyland & Hennigan 2003).

Generic features of *Corsia*

Since *Corsia* has some interesting specialised characters and is of very limited distribution in Australia, some notes on its generic features may be pertinent. Species of *Corsia* are highly specialised, achlorophyllous, cryptic herbs with a mycoheterotrophic life style. The plants are leafless, with fine filamentous roots which ramify for surprisingly long distances through leaf litter. The rhizome is much reduced and grows in increments which terminate in a flower stem. The thin, wiry scape bears sheathing bracts and a single terminal flower which, in the New Guinea species, is erect in bud. The perianth segments consist of three petals and two lateral sepals which are similar or subsimilar in shape and size. The third sepal is greatly expanded and modified to form a labellum (note that in Orchidaceae the labellum is a modified petal). All species of *Corsia* from New Guinea have the labellum held erect or more or less held horizontally like an umbrella above the stamens and style, and all have six stamens. The staminal filaments are connate basally and also fused with the base of the style to form a column-like structure. The filaments are erect in bud and also in the early stages of anthesis and then the anthers fall off and the filaments recurve, leaving the style to elongate and the stigmatic lobes to expand and become receptive. The fruit is an elongated three-valved capsule with the valves spreading outwards at maturity, the placentas detaching from the outer walls and the seeds hanging from long thread-like funicles.

Infrageneric Classification of *Corsia*

Two sections, *Sessilis* and *Unguiculatis*, were recognised within *Corsia* by Van Royen (1972), but as section *Sessilis* contains *C. ornata* Becc., the designated type of the genus, it must be recognised as section *Corsia* (ICBN, autonym rule, article 22). Additionally the adjectival epithet *unguiculatis* should be *Unguiculatae* (ICBN, article 21.2). In both section *Corsia* and section *Unguiculatae*, the ovary is straight or slightly curved, the buds are erect, the labellum is held erect or above the sepals and petals like an umbrella and there are six functional stamens and no staminodes. These sections can be distinguished thus:

Section *Corsia* - Petals and sepals linear, rarely ovate-linear, usually hanging down beneath the labellum; basal callus attached to the ovary with a broad base. **Type species:** *C. ornata* Becc.

Section *Unguiculatae* Van Royen - Petals and lateral sepals ovate, much shorter than the labellum, curved inwards to form a cup-like structure which holds the stamens and style; basal callus a narrow linear lamella. **Type species:** *C. unguiculata* Schltr.

Unique features of the Australian species

The Australian species of *Corsia* is quite divergent from all New Guinea taxa and differs in at least four significant morphological features.

1. The ovary is strongly arcuate to uncinate and as a consequence the buds are cernuous (ovary straight to slightly arcuate in New Guinea taxa, with erect buds).

2. The labellum is held below the perianth segments (held erect or above the perianth segments like an umbrella in the New Guinea taxa).

3. The lateral sepals and petals recurve away from the stamens and style (in section *Unguiculatae* these organs hang down beneath the labellum, whereas in section *Corsia* they curve inwards to form a cup-like structure which holds the stamens and style).

4. The flowers have five stamens and a staminode (six stamens and no staminodia in the New Guinea species).

The Australian species does not align into either of the two sections as circumscribed above. A new infrageneric taxon may be required; however, this should wait until a detailed phylogenetic analysis is carried out.

Taxonomy

Corsia dispar D.L.Jones et B.Gray, **species nova** ab *C. unguiculata* Schltr. ovario recurvissimo; floribus ferrugineis, labello ovato ad basim cuneato et limbo multo crassior et callo brevi atque calcariformi, differt. **Typus:** Queensland. Cook District: Longlands Gap, Herberton Range, 17°28′S, 145°38′E, 6 April 1999, *B.Gray 7516* (holo: QRS*; iso: BRI, CANB, MEL, MO, NSW).

Corsia sp. (Herberton Range B.Gray 3994) (Bostock 2007).

Brownish pink terrestrial herb growing in loose colonies. Roots filamentous, branched, arising from nodes on the rhizome. Rhizome horizontal, *c.* 4 mm thick, produced in annual increments. Leaves reduced to sheathing bracts. Scape erect, 8–18 cm long, 1.5–2 mm thick, terete, brownish pink to pale mauve. Bracts closely sheathing, 4–7, ovate to ovate-lanceolate, 10–25 mm long, 4–6 mm wide, pallid, acuminate. Pedicel 4–6 cm long. Ovary arcuate to uncinate, 15–20 mm long, *c.* 1.5 mm wide, brownish pink with reddish ribs. Flower solitary, 2–2.6 cm long, 1.3–1.6 cm wide, mostly brownish pink to light reddish brown. Lateral sepals and petals recurved away from the stamens and style, asymmetrical, ovate, 7–8 mm long, 2.5–3 mm wide, translucent white, irregularly mottled with purplish-red, the apex long-acuminate, darker, papillate, contracting and becoming filiform with age. Labellum, including limb, 20–30 mm long, projecting below the perianth segments; limb projecting downwards, *c.* 5 mm long and 2 mm wide, whitish, winged; lamina at right angles to the limb, ovate, 15–25 mm long, 10–14 mm wide, light reddish brown to brownish pink with a cream basal edge, with 16–24 darker longitudinal nerves, acuminate to long-acuminate. Callus a small projecting reddish-black spur at the junction of the labellum limb and lamina. Stamens 5, and a staminode on the medial side, held beneath the lateral sepals and petals; filaments *c.* 1.5 mm long, white, connate basally, initially erect then recurved; anthers oblong-elliptic, *c.* 1.7 mm long, yellow, abscising with age; staminode anterior to the style, similar in size and shape to a filament, remaining erect. Style columnar, *c.* 1.7 mm long; stigma three-lobed, yellow. Capsule erect, linear-oblong, 20–35 mm long, 2–2.5 mm wide, brownish. Seeds red-brown to blackish, with translucent funicles. **Fig. 1**.

***Additional specimens examined*: Queensland.** Cook District: Windsor Tableland, 23 km past Spencer Creek, S.F. 144, 16°14′S, 145°00′E, Apr 2002, *Booth 3081, Jensen & Cooper* (BRI); W of Karnak via Mossman, 16°23′S, 145°16′E, Jan 1995, *Cooper & Cooper WWC 869* (QRS); Mt Lewis, 16°35′S, 145°15′E, Jan 1994, *Cooper & Cooper WWC720* (QRS); S.F.R. 194, Western, Compartment 52, 17°17′S, 145°27′E, Feb 1967, *Dansie AFO4010* (BRI, QRS); S.F.R. 194, Western, Compartment 53, 17°18′S, 145°25′E, Feb 1976, *Hyland 8632* (QRS); Massey Creek, Ravenshoe – Millaa Millaa road, 17°35′S, 145°35′E, Feb 1977, *Gray 274* (QRS); Massey Creek, Ravenshoe – Millaa Millaa road, 17°36′S, 145°33′E, May 2002, *Holmes 204* (BRI); Massey Creek, Portion 297, Parish of Dirran, 17°37′S, 145°35′E, Apr 1985, *Gray 3994* (BRI, QRS); Massey Creek near Ravenshoe, 17°37′S, 145°35′E, Mar 2004, *Cooper & Jensen WWC 1837* (CANB); *c.* 1 km N of Chamillan Creek crossing, Ravenshoe – Koombooloomba road, 17°42′S, 145°31′E, Mar 1968, *Gray s.n.* (CANB); road to Koombooloomba Dam, 1 km N of Charmillan Creek, 17°42′S, 145°31′E, Mar 2004, *Gray 8901* (QRS).

***Distribution and ecology*:** *Corsia dispar* is widespread on the Atherton Tableland, Mt Lewis and Windsor Tableland areas in north-eastern Queensland, but is seldom collected. It grows on slopes close to streams in tall rainforest on both basalt and granite formations. Plants are found in small, loose groups among leaf litter in gravelly loam. Recorded altitude ranges from about 900 to 1100 m.

***Notes*:** *Corsia dispar* would seem to be most closely related to *C. unguiculata* as the two species share an extended basal limb on the labellum and a narrow callus. The new species can however be readily distinguished by its strongly recurved ovary (straight in *C. unguiculata*), light reddish brown flowers (purplish-red in *C. unguiculata*), ovate labellum with a cuneate base (broadly ovate with a cordate or truncate base in *C. unguiculata*), much thicker basal limb and, with a short, erect, spur-like callus (narrow upright crested ridge in *C. unguiculata*).

The roots of *Corsia dispar* definitely branch although Van Royen (1972) records

*all specimens from QRS are now housed in CNS

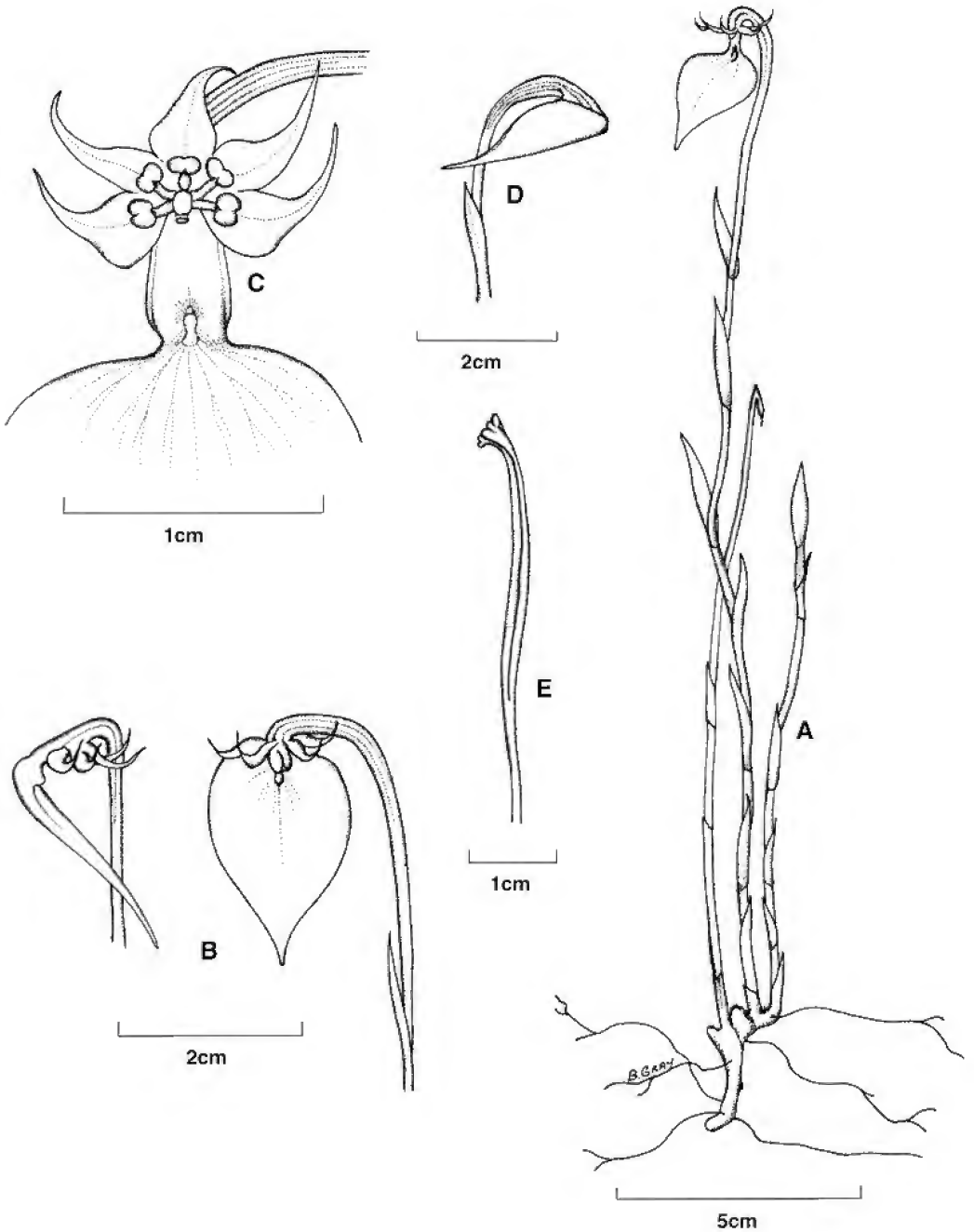

Fig. 1. ***Corsia dispar***. A. flowering plant. B. flower, side view and front view. C. top of flower showing tepals, stamens, staminode, labellum limb, base of labellum lamina and callus. D. bud. E. capsule. A & B from *Gray 7516* (QRS); C from *Gray 8901* (QRS); D & E from *Cooper WWC 1837* (QRS). Del. B. Gray.

roots in the New Guinea species as unbranched. This appears to be an oversight as several collections from New Guinea at CANB also have branched roots. The flowers of *C. dispar* are protandrous as previously noted in other taxa (Smith 1907; Gibbs 1917; Van Royen 1972). Van Royen (1972) also noted in his genus description that the anthers are introrse, however the anthers are extrorse at anthesis in *C. dispar*. They are also noted in other publications as being extrorse (Dahlgren *et al.* 1985). Similarly in the family description Van Royen noted that the pedicels usually elongated after flowering but, whereas in *C. dispar* a thickening of the pedicel after fertilisation has been observed, no increase in length was measured on fruiting specimens.

***Phenology*:** Plants flower mainly in January–March (rarely as late as May) and fruit in March–April (once in June). In seasons of regular or continuous rainfall, new inflorescences are produced from the rhizomes and extend the flowering and fruiting period.

***Etymology*:** The specific epithet is from the Latin *dispar*, *disparis*, unlike, dissimilar, different, in reference to the distinctive characters of the Australian species.

New combination for a New Guinea taxon

The rank chosen for *Corsia purpurata* var. *wiakabui* (Takeuchi & Pipoly 1998) seems inappropriate in such a highly specialised genus as *Corsia*. Any perceived relationship by the authors between *Corsia purpurata* and its variety must be considered tenuous, as species of *Corsia* are generally considered to be narrow endemics (Van Royen 1972). By contrast *Corsia purpurata*, which occurs in the vicinity of Lake Habbema in Irian Jaya, and *C. purpurata* var. *wiakabui*, described from specimens collected in New Ireland, are separated by a geographical distance of more than 2000 km and occur on different tectonic plates. Morphologically *Corsia purpurata* var. *wiakabui* can be distinguished from *C. purpurata* by its much larger labellum (16–19 mm × 20–23 mm) which is tranversely ovate to flabellate with a nearly truncate base. By contrast the labellum of *Corsia purpurata* is 10–13 mm × 9–10 mm, elliptic-rhomboid in shape and with a cuneate base. From these biogeographical and morphological considerations it seems best to consider these taxa specifically distinct and a new combination is here made at that rank.

Corsia wiakabui (Takeuchi & Pipoly) D.L.Jones & B.Gray, **combinatio et status nova**

Basionym: *Corsia purpurata* L.O.Williams var. *wiakabui* Takeuchi & Pipoly, *Sida* 18: 164 (1998). **Type:** Papua New Guinea. New Ireland: Hans Meyer Range, pond next to "Lake Camp", 28 January 1994, *W.Takeuchi & J.Wiakabu* (holo: LAE, *n.v.*).

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We thank the late Jim Willis and the late Pieter Van Royen for their contributions very early in this study, Wendy and Bill Cooper and Rigel Jensen for reigniting our interest following the bounteous wet season of 2004, Laurie Adams for the Latin diagnosis and discussions about the botanical code, Mark Clements for discussions on the geography of New Guinea, Peter Bostock for information on the *Corsia* collections at BRI and Rebel Elick for assistance at QRS. Karina Richards, Mark Clements and Wendy Cooper commented on the manuscript.

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Capparis batianoffii Guymer (Capparaceae), a new species from central coastal Queensland

G.P. Guymer

Summary

Guymer, G.P. (2008). *Capparis batianoffii* Guymer (Capparaceae), a new species from central coastal Queensland. Austrobaileya 7(4): 723–725 (2008). The new species *Capparis batianoffii* (*Capparis* section *Monostichiocalyx* Radlk.) is described and illustrated, together with information on its distribution, habitat and conservation status.

Key Words: *Capparis batianoffii*, Capparaceae, Queensland flora, Australian flora, new species

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Introduction

An undescribed species of *Capparis* L. belonging to *C.* section *Monstichiocalyx* Radlk. has been recognised to occur on Gloucester Island, central coastal Queensland, since it was first discovered by George Batianoff in 1992. Further collections of this species were made by Batianoff in 1994. It has been referred to as *Capparis* sp. (Gloucester Island G.N. Batianoff 920912) at the Queensland Herbarium (Jessup 2007).

Materials and methods

The paper is based on specimens held at the Queensland Herbarium (BRI). The terminology for *Capparis* follows that used by Jacobs (1965). Measurements of the flowers are based on dried or reconstituted material.

Taxonomy

Capparis batianoffii Guymer, **species nova** affinis *C. sarmentoso* Cunn. ex Benth. sed ab ea staminibus 8 (adversum 19–22) et foliis, sepalis, petalis et gynophoris pubescentibus (non glabellis vel glabrescentibus) differt. **Typus:** Queensland. North Kennedy District: Gloucester Island, East coast, 5 km N of Chinaman's Rock, 1 September 1992, *G.N.Batianoff 920912* (holo: BRI; iso: BRI, K, MEL distribuendi).

Capparis sp. (Gloucester Island G.N. Batianoff 920912) (Jessup 2007)

Climbing scrambling shrubs to 6 m, branches pendulous. Stipular spines present, acicular, 2–3 mm long, recurved, cream or brown, pubescent with upper half glabrous. Branchlets pubescent with sandy or pale brown contorted simple hairs. Leaves distichous; lamina ovate, obovate, ovate-lanceolate or lanceolate, 10–20 × 3.5–7 mm; apices obtuse, rounded or retuse, with a small mucro to 1 mm long; bases cuneate; pubescent above (mid-dense) and below with sandy or pale brown simple contorted hairs (0.1–) 0.2–0.75 mm long; margins slightly recurved; lateral veins 5–7 pairs; venation slightly raised above and below, midrib sunken above, raised below; petioles pubescent, 1–1.5 mm long. Inflorescence axillary, solitary or a collateral pair; pedicels 9–10 mm long, with sandy or pale brown simple hairs. Flowers white, aromatic, buds globose. Sepals 4; outer two cymbiform, 5.6–7 × 4–4.5 mm, inner two ovate, 4.8–5.5 × 3.5–4 mm, densely pubescent outside with sandy or pale brown simple hairs 0.3–0.7 mm long, glabrous inside. Petals 4; obovate, 10–11 × 3.5–4 mm, pubescent outside with sandy or pale brown simple hairs 0.3–0.7 mm long, glabrous inside. Stamens 8; anthers 2.8–3.3 × 1.2–1.4 mm; filaments filiform, 18–20 mm long, glabrous. Gynophore filiform, 17–18 × 0.2–0.3 mm diameter, glabrous above the middle, pubescent below with sandy or pale brown simple hairs 0.3–0.6 mm long. Ovary ovoid, 2.8–3.3 × 1.2–1.3 mm, smooth, glabrous; style 1–1.2 mm long; stigma globular, *c.* 0.5 mm diameter; placentas 4, ovules 16–26, in 2 rows. Berry not seen. **Fig. 1.**

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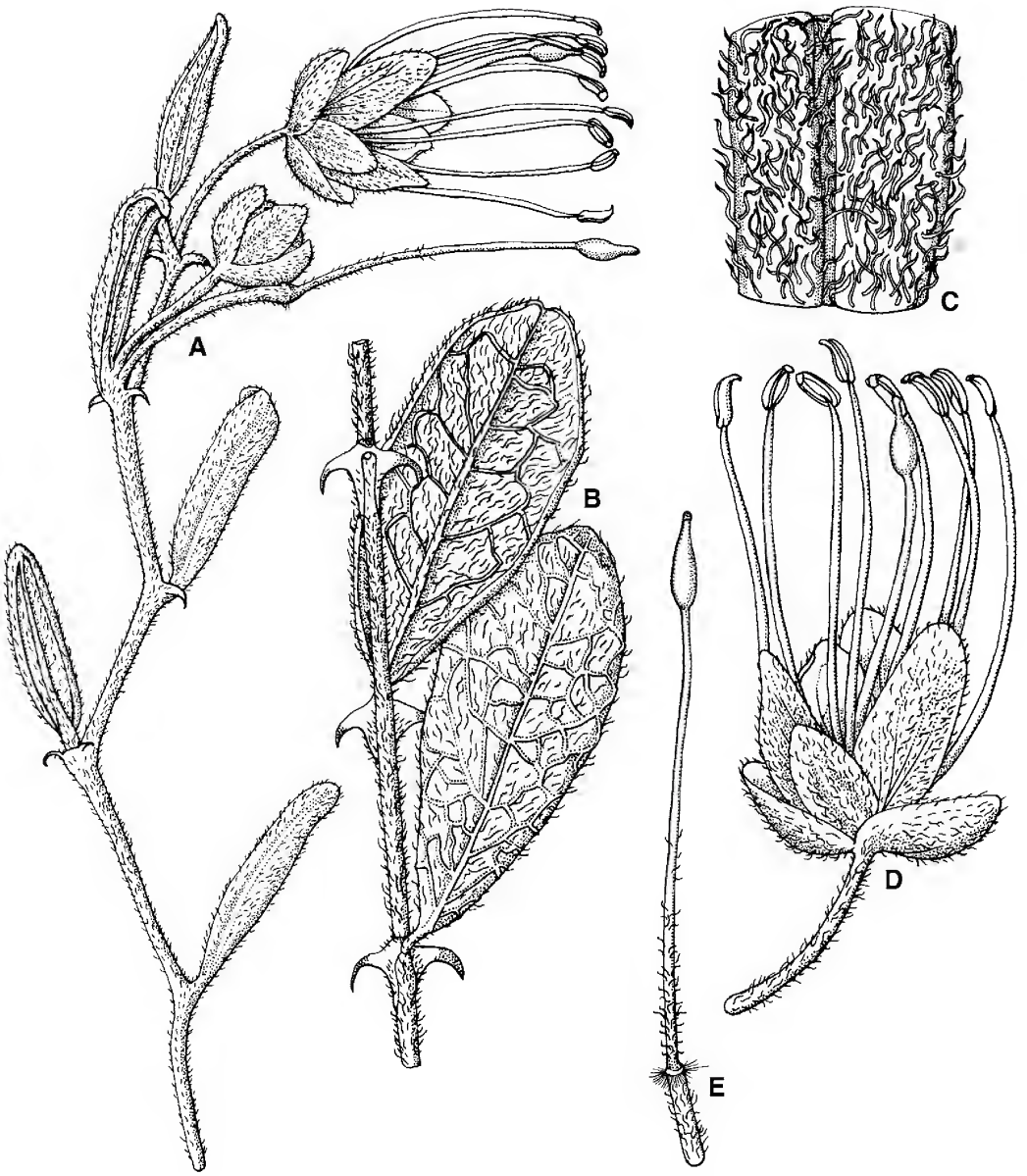

Fig. 1. ***Capparis batianoffii***. A. flowering branchlet × 2. B. leaves × 4. C. adaxial leaf surface × 12. D. flower × 3. F. gynophore and ovary × 4. All from *Batianoff 920912* (BRI). Del. W. Smith.

***Additional specimens examined*: Queensland.** North Kennedy District [all Gloucester Island]: E coast, site 28, April 1994, *Batianoff 940401Z & Figg* (BRI); E side bay, site 16, April 1994, *Batianoff 940446 & Figg* (BRI).

***Distribution and habitat*:** *Capparis batianoffii* is known only from Gloucester Island, off the central coast of Queensland from three locations and six individual plants (Batianoff *et al.* 1997). It occurs in Araucarian vine thickets (Regional ecosystem 8.12.11) on slopes amongst granitic boulders from near sea-level to 400 m.

***Notes*:** *Capparis batianoffii* appears to be allied to *C. sarmentosa* but differs from this

species by its fewer stamens (8 *cf.* 19–22) and its pubescent leaves, sepals, petals and gynophores.

Capparis batianoffii will key to *Capparis quiniflora* DC. in *Flora of Australia* (Hewson 1984) but it is readily distinguished from this species by its much smaller leaf blades (10–20 mm *cf.* 55–120 mm) and petioles (1–1.5 mm *cf.* 5–17 mm), and inflorescences (single or collateral pair *cf.* 2–10-flowered racemes).

***Conservation status*:** *Capparis batianoffii* is known to occur only on Gloucester Island. The island of 2,960 hectares is part of the Gloucester Islands National Park and lies within the Great Barrier Reef World Heritage Area. The species is known from three locations on the Island with a known area of occupancy of less than 20 km^2. Batianoff *et al.* (1997) reported six individual plants from these three locations. The species is threatened from chance stochastic events (e.g. drought, fire) and its conservation status is assessed as vulnerable based on criterion D (it has an area of occupancy of less than 20km and fewer than 1000 mature individuals) (IUCN 2001).

***Etymology*:** Named for George Nicholas Batianoff, Principal Botanist, Queensland Herbarium, who discovered and made the first collections of this species and who has published extensively on the vegetation of coastal Queensland.

Acknowledgements

I thank Will Smith (BRI) for the illustrations and Peter Bostock for assistance with the Latin diagnosis.

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SHORT COMMUNICATION

Reinstatement of *Ammannia triflora* Benth. (Lythraceae)

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Bentham (1867) named *Ammannia triflora* based on a Robert Brown collection from the islands of the Gulf of Carpentaria. The name was in use for many years, until the publication of the Lythraceae treatment in the Flora of Australia series.

Therein, Hewson (1990) declared *A. triflora* Benth. to be an illegitimate name, with the statement "*nom. illeg. non* Wallich (1828)". Hewson renamed the species *A. pubiflora* (Koehne) Hewson.

Wallich's publication, referred to by Hewson, is his "Numerical List of Dried Specimens of plant, in the East India Company's Museum (1828–1849)", often cited as "Wallich's Catalogue". *Ammannia triflora* Wall., which appeared in this publication, is a *nomen nudum*, and hence not a legitimately published new species. Nor can it be considered a new combination based on *Lythrum triflorum* L.f. or its homotypic synonym *Nesaea triflora* (L.f.) Kunth (published in 1825), as Wallich did not give any indication that his name might be based on either of these.

Therefore, *Ammannia triflora* Benth. is a legitimate name, and is the oldest available name for the species that Hewson called *A. pubiflora*. Ironically, *A. pubiflora* (Koehne) Hewson is an illegitimate name, a later homonym of *A. pubiflora* (Koehne) Sosn., validly published in 1915.

Another matter in need of clarification is the collection date of the type. Chapman *et al.* (2001) listed the place and date of collection of *Ammannia pubiflora* (=*A. triflora* Benth.) as "Carpentaria island a Novr 27 1802". This was a transcription of the label of Brown's specimen at BM. Carpentaria island 'a' is Sweers Island (Chapman *et al.* 2001).

Flinders arrived at Sweers Island on the 16th November 1802, and did not leave until the 30th November. Brown is known to have collected on Sweers Island on several occasions, with his final visit on 27th November (Vallance *et al.* 2001). However, Hewson (1990) gave Robert Brown's date of collection as 27th August 1802. This is clearly an error, as on this date the expedition was still on the east coast of Queensland, around Shoalwater Bay.

Interestingly, the Queensland Herbarium does not hold any subsequent specimens of *A. triflora* from Sweers Island. This is despite visits there by several botanists, including J.F.Bailey, J.Shirley, D.Henne, L.Pedley and M.Thomas. In fact, only Robert Brown has collected the species from (what is now) Queensland.

The revised synonymy for *Ammania triflora* is as follows:

Ammannia triflora Benth., *Fl. Austral.* 3: 297 (1867); *Nesaea lanceolata* var. *pubiflora* Koehne, *Bot. Jahrb. Syst.* 3: 326 (1882); *Ammannia pubiflora* (Koehne) Hewson, *Fl. Australia* 18: 321 (1990), *nom. illeg. non* (Koehne) Sosn. (1915). **Type:** [Queensland] Sweers Island, 27 November 1802, *R.Brown* (lecto: BM [here designated]; isolecto: BRI; NSW).

[*Ammannia triflora* Wall., *Numer. List* n. 6323 (1832), *nom. nud.*]

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SHORT COMMUNICATION

A new combination in *Cissocarpus* Rozefelds (Vitaceae), a fossil genus from Queensland

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Recent molecular, phylogenetic analyses of *Cissus* L. (Rossetto *et al.* 2002, Rossetto *et al.* 2007; Soejima & Wen 2006), together with the transfer of *Cissus opaca* F.Muell. to *Clematicissus* Planch. (Jackes & Rossetto 2006) prompted the present authors to re-examine names in this genus. This study led to a misplaced combination in *Cissus*, namely *Cissus jackesiae* Rozefelds, for a species described only from fossil seeds. As this species was cited as the type of the current form genus *Cissocarpus* Rozefelds (as '*Ciccocarpus jackesiae*', an orthographically correctable error for *Cissocarpus*), we felt that *Cissus jackesiae* should be transferred to that genus.

The reference to "aff. *Cissocarpus jackesii* Rozefelds" in Carpenter *et al.* (2004: 706), is construed here as a *nomen nudum*, since it fails Art. 33.4 of the International Code of Botanical Nomenclature (ICBN) (McNeill *et al.* 2006) *viz.* 'that a new combination is not validly published unless its basionym (name-bringing or epithet-bringing synonym) ... is clearly indicated and a full and direct reference given to its author and place of valid publication, with page or plate reference and date'. It is also orthographically incorrect in that the name *Cissus jackesiae* Rozefelds commemorates Betsy R. Jackes and so under Art. 60.11 should have the feminine ending *-iae* as recognised by Rozefelds (1990).

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Cissocarpus jackesiae (Rozefelds) Bostock & Clifford, **combinatio nova**

Basionym: *Cissus jackesiae* Rozefelds in J.G. Douglas & D.C. Christophel (eds.), *Proceedings of the 3rd IOP Conference, Melbourne, 1988* (1990: 124). A–Z Printers: Melbourne.

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SHORT COMMUNICATION

Notes on *Palmeria* F.Muell. (Monimiaceae) in Australia and the application of the name *Palmeria racemosa* (Tul.) A.DC.

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Whiffin & Foreman (2007) revised the genus *Palmeria* F.Muell. (Monimiaceae) for the *Flora of Australia* and recognised three species, *viz. P. foremanii* Whiffin, *P. hypotephra* (F.Muell.) Domin and *P. scandens* F.Muell. They considered *Palmeria scandens* to include *P. coriacea* C.T.White and *P. racemosa* (Tul.) A.DC. However, the legitimate name for this species when these species are considered to be synonymous is *P. racemosa* as its basionym pre-dates *P. scandens* by nine years.

Based on examination of herbarium material and literature at the Queensland Herbarium five species of *Palmeria* (*viz. P. coriacea*, *P. foremanii*, *P. hypotephra*, *P. racemosa* and *P. scandens*) are recognised for Australia. This is due to reinstatement of *P. coriacea* from north-east Queensland and recognition of *P. racemosa* for south-east Queensland and eastern New South Wales populations previously included erroneously in *P. scandens*.

Key to the Australian *Palmeria* species

1 Leaves velutinous below and densely covered with white or cream stellate hairs (0.2–0.5 (–0.7) mm diameter). Central coast and NE Qld . . . . . **3. P. hypotephra**

1. Leaves glabrous or pubescent below, with pale brown or golden stellate hairs (0.3–1.5 mm diameter) or stellate and simple hairs, not covering the leaf surface 2

2 Leaves glabrous below or with an occasional stellate hair (0.1–0.4 mm diameter) along the midrib. NE Qld (Thornton Peak, Mt Spurgeon & Tinaroo Range above 900 m) . . . . . **1. P. coriacea**

2. Leaves pubescent below with either predominantly stellate hairs (0.3–1.3 mm diameter) or a mixture of simple and stellate hairs 3

3 Leaves pubescent below with simple hairs (0.3–1.1 mm long) and stellate hairs (0.3–1.3 mm diameter) (occasionally with only simple hairs). Central coast to Cape York, Qld . . . . . **5. P. scandens**

3. Leaves pubescent below with stellate hairs (0.3–1.5 mm diameter) and an occasional simple hair 4

4 Leaf pubescence below of stellate hairs (0.3–1.5 mm diameter) touching to overlapping. SE Qld, NE NSW . . . . . **2. P. foremanii**

4. Leaf pubescence below of stellate hairs (0.3–1.1 mm diameter) restricted to midrib, or midrib and lateral veins. SE Qld, E NSW . . . . . **4. P. racemosa**

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Synopsis of Australian species

1. Palmeria coriacea C.T.White, *Proc. Roy. Soc. Queensland* 47: 75 (1936). **Type:** Queensland. Cook District: Thornton Peak, 14 March 1932, *L.J. Brass 2282* (holo: BRI).

***Additional selected specimens examined*: Queensland.** Cook District: Mt Misery, NE of Mt Carbine, Nov 1988, *Jessup GJM857, Guymer & McDonald* (BRI); Thornton Peak, Sep 1937, *Tryon s.n.* (BRI [AQ415815]); Mt Spurgeon, Sep 1936, *White 11050* (BRI); Timber Reserve 142, Zarda Logging Area, Jun 1973, *Irvine 651* (BRI); Mt Lewis road, Aug 1995, *Brown 95/294 f, Wiecek & Radford* (BRI); Tinaroo Range, Jun 1949, *Flecker NQNC12894* (BRI).

***Distribution and habitat*:** The species is endemic to north-east Queensland from Mt Misery to Tinaroo Range in rainforest at altitudes above 900 m.

2. Palmeria foremanii Whiffin, *Fl. Aust.* 2: 454 (2007). **Type:** Queensland. Darling Downs District: The Head, near source of Teviot Creek, 4 May 1978, *K.A. W.Williams 78049* (holo: BRI; iso: NSW, CANB *n.v.*, K *n.v.*).

Palmeria scandens var. *hirsuta* Domin, *Biblioth. Bot.* 89: 120 (1926). **Type:** Queensland: Moreton District: "Regenwalder der Tambourine Mts", January 1910, *K.Domin s.n.* (holo: PR, *n.v.*).

***Additional selected specimens examined*: Queensland.** Moreton District: Mt Glorious, Apr 1961, *Cribb s.n.* (BRI [AQ170425]); Tamborine Mt, Jan 1924, *Simmonds s.n.* (BRI [AQ63652]); Numinbah F.R., Springbrook Plateau, Jul 2006, *Halford Q9114* (BRI); Lyrebird Ridge road, Springbrook, May 1984, *Guymer 1892* (BRI); *ditto loc.*, Jan 2000, *Forster PIF2527 & Leiper* (BRI). Darling Downs District: Near Moss Gardens, The Head to Killarney road, Jan 2000, *Forster PIF25273* (BRI). **New South Wales.** North Coast: Acacia Plateau, Mar 1944, *White 12567* (BRI); N Yabbra road, Yabbra S.F., E of Urbenville, May 1998, *Bean 13233* (BRI, NSW); Track to Minyon Falls, Apr 1984, *Guymer 1881* (BRI); Whian Whian S.F., Jun 1945, *White 12832* (BRI).

***Distribution and habitat*:** The species is endemic to eastern Australia from Mt Glorious, Queensland to Whian Whian State Forest, New South Wales at altitudes between 100 and 1100 m. It occurs in rainforests on soils derived mainly from basalt.

3. Palmeria hypotephra (F.Muell.) Domin, *Repert. Spec. Nov. Regni Veg.* 12: 390 (1913); *Morinda hypotephra* F.Muell., *Vic. Nat.* 6: 55 (1889). **Type:** Queensland. Cook District: Mt Bellenden Ker, in 1887, *W.A.Sayer s.n.* (lecto: MEL, *n.v.*); *fide* Whiffin & Foreman (2007).

***Additional selected specimens examined*: Queensland.** Cook District: Top of Mt Hartley, Jul 1995, *Forster PIF17320 & Figg* (BRI); Whyanbeel, Dec 1978, *Gray 1185* (BRI); Mt Bellenden Ker summit, Dec 2001, *Forster PIF27935 & PIF27942* (BRI); The Boulders, W of Babinda, Jul 1999, *Forster PIF24665* (BRI); Westcott road, Topaz, Nov 1989, *Forster PIF25154, Booth & Cooper* (BRI); Tully Falls Weir, May 2003, *Forster PIF29392* (BRI). North Kennedy District: Millet Farm, Ravenshoe, Apr 1940, *Samundsett 3* (BRI); Alma Gap S.F., 22 km NW of Cardwell, Oct 1988, *Jessup GJM2404, Guymer & McDo*nald (BRI); Paluma, Jun 1988, *Jackes 1* (BRI). South Kennedy District: Dalrymple road to Mt William, Eungella N.P., *s.d., Pearson SP462* (BRI).

***Distribution and habitat*:** The species is endemic to north-east Queensland from Mt Hartley to Eungella, west of Mackay. It occurs in simple microphyll fern thicket, low microphyll vineforest and complex notophyll and mesophyll vineforest from near sea-level to 1570 m.

4. Palmeria racemosa (Tul.) A.DC., *Prodr.* 16(2): 657 (1868); *Hedycarya racemosa* Tul., *Ann. Sci., Nat. Bot.*, ser. 4, 3: 45 (1855). **Type:** Nova Hollandia, in 1834, *Hügel s.n.* (syn: P *n.v.*; W *n.v.*); Nova Hollandia, *s.d., Baume s.n.* (syn: P *n.v.*; W *n.v.*).

***Additional selected specimens examined*: Queensland.** Wide Bay District: Kin Kin, Mar 1916, *Francis s.n.* (BRI [AQ63661]). Moreton District: Sunday Creek road, Conondales, Jan 2002, *Forster PIF28094 & Leiper* (BRI). **New South Wales.** Northern Tablelands: Slaty Fire trail, Girard S.F., ENE of Tenterfield, Apr 2004, *Bean 21931* (BRI). North Coast: Dorrigo S.F., Oct 1930, *White 7503* (BRI); Below Cameron's Camp on Hasting Forest Highway, Mar 1978, *Hind 2234* (BRI); Upper Williams River, near Salisbury, Mar 1938, *White 11603* (BRI); Macquarie Pass, Jan 1962, *Burgess 15243* (BRI).

***Distribution and habitat*:** The species is endemic to eastern Australia from Kin Kin, south-east Queensland to Bateman's Bay, south coast of New South Wales. It occurs in rainforests and on rainforest margins from near sea level to 1000 m altitude.

***Notes*:** Hügel's specimen of *Palmeria racemosa* would have been collected between April and October 1834 when he visited areas from the Hunter River to Illawarra, New South Wales (Clark 1994).

5. Palmeria scandens F.Muell., *Fragm.* 4: 152 (1864); *Palmeria scandens* var. *scandens*, Domin, *Biblioth. Bot.* 89: 120 (1926). **Type:** Queensland. North Kennedy District: Rockingham Bay, in 1863, *J.Dallachy s.n.* (lecto: MEL 2050674 *n.v.*); *fide* Whiffin & Foreman (2007).

***Additional selected specimens examined*: Queensland.** Cook District: Mt Finnegan summit area, Oct 1999, *Forster PIF25037 & Booth* (BRI); Noah Creek, Dec 2001, *Forster PIF27896, Young & Booth* (BRI); S.F. 194, Mt Baldy, Dec 2001, *Forster PIF27998* (BRI); Jordan Logging Area, 16.5 km SE of Millaa Millaa, Oct 1988, *Jessup GJM2070, Guymer & McDonald* (BRI); Yarrabah, Aug 1918, *Michael s.n.* (BRI [AQ63664]). North Kennedy District: Bishop Peak, Hinchinbrook Channel N.P., N of Ingham, May 1991, *Bean 3244* (BRI); Headwaters of Dryander Creek, Mt Dryander, Oct 1969, *Webb & Tracey 10034* (BRI). South Kennedy District: Dalrymple road, Eungella N.P., Apr 2000, *Forster PIF25509 & Booth* (BRI).

***Distribution and habitat*:** The species is endemic to Queensland from the McIlwraith Range, Cape York to Eungella National Park, west of Mackay, in rainforests or on rainforest margins from near sea-level to 1200 m altitude.

Discussion

Brophy *et al.* (2004) analysed the essential oils from the leaves of Australian species of *Palmeria* (Monimiaceae) excluding *P. coriacea*. The results from their samples using the classification above shows that *P. foremanii* (*Forster PIF25277*) has eight unique compounds, *P. hypotephra* (*Forster PIF27935*) has four unique compounds, *P. racemosa* (*Forster PIF28094*) has five unique compounds and *P. scandens* (*Forster PIF25509*, *PIF25037 & PIF27596*) has no unique compounds with the exception of *Forster PIF27998* from Mt Baldy which has five unique compounds. This collection differs from the other *P. scandens* in having only simple hairs on the branchlets and leaves and may represent a distinct taxon.

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SHORT COMMUNICATION

Two new species of *Pandorea* Spach (Bignoniaceae) recognised from Queensland

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The following new combinations in *Pandorea* Spach are required to formally recognise two Queensland species that are distinct from *Pandorea pandorana* (J.Kenn. & Andrews) Steenis, the Norfolk Island trumpet flower.

Bignonia pandorana J.Kenn. & Andrews (the basionym of *Pandorea pandorana*) was described from plants grown from seeds sent by Colonel William Paterson, then stationed at Norfolk Island, to James Lee and John Kennedy, nurserymen at Hammersmith, London who first raised it to flowering stage in 1793. Flowering material was used by John Kennedy in Andrews (1800) for the written description and Andrews based his illustration on plants "in the collection of J. Vere, Esq. Kensington Gore". Most databases and publications cite the authorship as merely 'Andrews'; however, the description of this species was most likely to have been by John Kennedy (Stafleu & Cowan 1976) who was Andrew's father in-law.

Green (1990, 1994) has cast doubt on a Norfolk Island origin for this species and believed a mistake was made in its provenance, stating that it came from Sydney or from cultivated material imported from New South Wales. There is no evidence to suggest this occurred as Colonel William Paterson was stationed on Norfolk Island from November 1791 to March 1793 and collected seeds and specimens that he sent to Banks (see Paterson correspondence to Banks, State Library of NSW/80239-47.jpg) and in 1794 discussed with Banks the publication of his memoranda on the natural history of Norfolk Island (Paterson's manuscript with illustrations by John Doody that Paterson sent to Banks is now held in the State Library of New South Wales, Sydney). The species was reported by Kennedy in Andrews (*loc. cit.*) to be attacked severely on Norfolk Island by a "white downy insect of the genus Aphis" that covered the whole plant and prevented vegetables being grown on the Island. Interestingly, Paterson in a letter to Banks dated 23 May 1793 (State Library of NSW CY3008/244) refers to a box he is sending with "some of the destructive fly of Norfolk Island". Banks has written in the letter's margin 'a small cicada', perhaps referring to the Norfolk Island cicada (*Kikihia convicta* (Distant)); however, this is thought unlikely as the actual insect causing the damage.

Andrews did not have a herbarium (Stafleu & Cowan 1976) but based on his illustration of *Bignonia pandorana* it has 5–11 lanceolate leaflets with serrate-dentate margins, white flowers with red inside the tube and with a red upper style and stigma. The illustration appears to be more closely allied to Green's (1994) *Pandorea pandorana* subsp. *austrocaledonica* (Bureau) P.S.Green from Lord Howe Island than to any mainland Australian *Pandorea*. The first settlement of Norfolk Island (1788 to 1814) resulted in the clearing of 25% of the Island's native vegetation and may have caused the extinction of *Pandorea pandorana*. Green (1990) supports his argument that *Pandorea* did not naturally occur on the island by the fact that Bauer did not collect or illustrate this species during his stay there from August 1804 to February 1805 as it was not mentioned by Endlicher (1833). If Kennedy's claim that the species was susceptible to insect attack is indeed true, together with the fact that 619 hectares had been cleared by 1796, then this

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species may well have disappeared before Bauer's arrival on Norfolk Island.

Pandorea floribunda (A.Cunn. ex DC.) Guymer, **combinatio nova**

Basionym: *Tecoma floribunda* A.Cunn. ex DC., *Prodr.* 9: 225 (1845). **Type:** "In Novae Hollandiae rupestribus ad Moreton-bay", thickets and margins of creeks, Moreton Bay, in 1828, *A. Cunningham s.n.* (holo: G-DC, microfiche BRI!).

Pandorea sp. (K.A.Williams 86020) (Guymer 2007)

***Additional selected specimens examined*: Queensland.** Port Curtis District: S.F. 67, Sep 1985, *Gibson 778* (BRI, NSW). Burnett District: Bunya Mountains, Oct 1917, *Swain s.n.* (BRI [AQ219029]). Wide Bay District: Fraser Island, near Lake Wabby, Aug 1941, *Blake 14385* (BRI). Moreton District: Dulong road, Dulong, Oct 1989, *Sharpe 4898* (BRI); Yarraman, Aug 1944, *Clemens s.n.* (BRI [AQ219049]); 5 km N of Dayboro, Mt Mee road, Sep 1989, *Henderson H3230 & Guymer* (BRI); Skyline Drive, Kholo, 10 km NW of Ipswich, Sep 1990, *Bird s.n.* (BRI, BISH, MO, NSW); Near Ankida N.R., Springbrook, Sep 2005, *Thompson MOR587* (BRI); Mt Lindesay, base of mountain, Oct 1932, *White 1552* (BRI). Darling Downs District: Spicers Peak, Main Range N.P., Sep 1995, *Forster PIF17648* (BRI); 0.7 km W of Moss Gardens, E of Killarney, Sep 2002, *Bean 19370* (BRI). **New South Wales.** North Coast: "Moore Park", Old Grevillea, Sep 1972, *Coveny 4567 & Rodd* (BRI); Lismore, Aug 1891, *Baeuerlen 480* (BRI, NSW).

***Distribution and habitat*:** The species occurs from Gladstone, south-east Queensland to Lismore, north-east New South Wales in rainforest, on the margins of rainforests and in adjoining eucalypt forests and woodlands, from near sea-level to 1200 m.

***Notes*:** This species is distinguished from *Pandorea pandorana* by its pale yellow or cream flowers and 3–5 broadly ovate to ovate, entire leaflets (3–8 × 1.5–5 cm).

Pandorea linearis (F.M.Bailey) Guymer, **combinatio et status nova**

Basionym: *Tecoma australis* var. *linearis* F.M.Bailey, *Queensl. Fl.* 4: 1134, pl. xlv (1901); *Pandorea australis* subsp. *linearis* (F.M.Bailey) Steenis, *Rec. Trav. Bot. Neerl.* 24: 863 (1927). **Type:** Herberton, *s.d., J.F.Bailey s.n.* (lecto [here designated]: BRI [AQ218976]).

***Additional selected specimens examined*: Queensland.** Cook District: Stannary Hills, 15 km S of Mutchilba, May 2006, *Forster PIF31678 & McDonald* (BRI, DNA, NSW); 6 km E of Irvinebank, May 1974, *Staples 260574/2* (BRI); On Silver Valley road, 3.4 km from Mt Molloy, Apr 1988, *Forster PIF3972* (BRI); 12 km along Deadman's road, off Silver Valley road, Feb 1996, *Forster PIF18414 & Ryan* (BRI). North Kennedy District: Between St Pauls and Steward Head, E of Herberton, Jun 2005, *McDonald KRM4275* (BRI); Ewan road, Mt Spec area, 17.6 km from Paluma, Sep 1974, *Williams 58* (BRI); 17.4 km W of Ivy Teahouse (Paluma), Aug 1994, *Kemp 570H & Kutt* (BRI); 5.6 km SE of Hidden Valley, along Paluma Road, Feb 2000, *Pollock ABP817 & Edginton* (BRI); Between Bluewater Gorge and Pattersons Gorge, Paluma Range, *Cumming 20659* (BRI).

***Distribution and habitat*:** The species occurs from Stannary Hills to Paluma Range, north-east Queensland in eucalypt woodlands, open forests and shrublands.

***Notes*:** *Pandorea linearis* is distinguished from *P. pandorana* by its 9–13 linear to linear-lanceolate entire leaflets, the lateral leaflets 1.1–4.2 × 0.15–0.6 cm.

The type collection of *Tecoma australis* var. *linearis* comprises 3 sheets at BRI collected by J.F.Bailey from Herberton. The BRI collection AQ218976 is here selected lectotype as it agrees with Bailey's description and has leaves and flowers.

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SHORT COMMUNICATION

New combinations in *Liparis* Rich. and *Pterostylis* R.Br. for two species of Orchidaceae from Queensland

Peter D. Bostock

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A number of segregate genera in Orchidaceae have been recently published (e.g. *Bunochilus* D.L.Jones & M.A.Clem.—segregated from *Pterostylis* R.Br.) or reinstated (e.g. *Diteilis* Raf.—segregated from *Liparis* Rich.) that are not currently recognised by the Queensland Herbarium. Two endemic Queensland species have been named in *Bunochilus* (Jones 2006a) and *Diteilis* (Jones 2006b) that require combinations in *Pterostylis* and *Liparis* respectively.

Pterostylis vitrea (D.L.Jones) Bostock, **combinatio nova**

Basionym: *Bunochilus vitreus* D.L.Jones, *Austral. Orchid Res.* 5: 116 (2006).

Liparis petricola (D.L.Jones & B.Gray) Bostock, **combinatio nova**

Basionym: *Diteilis petricola* D.L.Jones & B.Gray, *Austral. Orchid. Res.* 5: 74 (2006).

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Referees consulted for Volume 7 of *Austrobaileya*

Acceptance of papers has depended on the outcome of review by referees. Those consulted for the current volume are listed below. Several were consulted on more than one occasion. Sincere thanks are extended to all these people whose expertise has helped to maintain journal standards.

D.Albrecht

M.J.Bayly

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P.D.Bostock

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P.Brownsey

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P.H.Weston

K.L.Wilson

Paul G.Wilson

Peter G.Wilson

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